

THE  
WEST RIDING LUNATIC  
ASYLUM

MEDICAL REPORTS.

EDITED BY

J. CRICHTON BROWNE, M.D., F.R.S.E.

VOL. II.



LONDON:  
J. & A. CHURCHILL, NEW BURLINGTON STREET.

1872.

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"It is the uniform effect of culture on the human mind, not to shake our faith in the stability of particular phenomena as of heat, water, azote ; hut to lead us to regard nature as phenomenon, not a substance ; to attribute necessary existence to spirit, to esteem nature as an accident and an effect."—EMERSON.

"The charm dissolves apace,  
And as the morning steals upon the night,  
Melting the darkness, so their rising senses  
Begin to chase the ignorant fumes that mantle  
Their clearer reason.

"Their understanding  
Begins to swell, and the approaching tide  
Will shortly fill the reasonable shore  
That now lies foul and muddy."

SHAKESPEARE.



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## P R E F A C E.

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THE very favourable reception accorded to the first Volume of the West Riding Asylum Medical Reports, has rendered any apology for the second Volume unnecessary. In sending it forth, the Editor only desires to say, that, while the papers contained in it afford but a very inadequate idea of the Medical and Scientific work which is accomplished in this hospital, they may, perhaps, serve to indicate that the vast opportunities for observation and research which it offers are not altogether neglected, and that its medical officers hold constantly in view the great and paramount object of arriving at sound principles as to the prevention and cure of mental disease.



# CONTENTS.

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	PAGE
I. On Conia, and its Use in Subcutaneous Injection. By J. WILKIE BURMAN, M.D., Edin. . . . .	1
II. On the Minute Structure of the Cortical Substance of the Brain, in a Case of Chronic Brain Wasting. By HERBERT C. MAJOR, M.B., C.M., Edin. . . . .	41
III. Menstrual Irregularities and Insanity. By HENRY SUTHERLAND, M.A., M.B., Oxon., M.R.C.P., Lond. . . . .	54
IV. Experiments to ascertain the Effects of Ether and Nitrous Oxide combined, to which are added some General Observations on Stimulants. By SAMUEL MITCHELL, M.D., Edin. . . . .	73
V. Cranial Injuries and Mental Diseases. By J. CRICHTON BROWNE, M.D., Edin., F.R.S.E. . . . .	97
VI. Puerperal Mania. By GEORGE HENRY PEDLER, L.R.C.P., Lond. . . . .	137
VII. A New Method of Determining the Depth of the Grey Matter of the Cerebral Convolutions. By HERBERT C. MAJOR, M.B., C.M., Edin. . . . .	157
VIII. The Mental Symptoms of Ordinary Disease. By PATRICK NICOL, M.A., M.D. . . . .	177
IX. The Electric Treatment of the Insane. By T. CLIFFORD ALLBUTT, M.A., M.D., Cantab., F.L.S. . . . .	203
X. Ophthalmoscopic Observations in General Paralysis, and after the administration of Certain Toxic Agents. By CHARLES ALDRIDGE, M.B., L.R.C.P., Lond. . . . .	223

XI. The Use of Opium in the Treatment of Melancholia. By E. MAZIERE COURTENAY, M.B., A.B., T.C.D. ..	254
XII. Impairment of Language the result of Cerebral Disease. By W. A. F. BROWNE, M.D., F.R.C.S.E., F.R.S.E. ..	278
XIII. The Sphygmograph in Epilepsy. By GEORGE THOMPSON, L.R.C.P., Lond. .. .. .	302

# ON CONIA, AND ITS USE IN SUBCUTANEOUS INJECTION.

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By J. WILKIE BURMAN, M.D. (EDIN.);

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It is to Dr. John Harley<sup>1</sup> that we are principally indebted for our present more extended knowledge as to the physiological and therapeutic action of the preparations of Conium. Dr. Harley was the first to establish a rational use of this neurotic, and both he and Dr. Neligan have endeavoured to show that, excepting the *Succus*, the preparations of Conium, in the British Pharmacopœia, are quite inert, even in large and extraordinary doses.

During the last two years, the *Succus Conii* has been largely and very successfully used, at the West Riding Asylum, in the treatment of cases of mania,<sup>2</sup> and, although it is by far the best preparation of Conium we have yet got, there are, nevertheless, certain disadvantages appertaining to its use, and these are:—1st, that it varies very much in strength; and, 2nd, that, even with the best *Succus*, large doses are required to be given before the full physiological effect is produced, and, when the preparation is weak, the doses must be inconveniently large.<sup>3</sup> It is some-

<sup>1</sup> 'The Old Vegetable Neurotics,' Macmillan & Co., London, 1869.

<sup>2</sup> For the advantages and results of this form of treatment, see Dr. Crichton Browne's papers in the 'Lancet,' Feb. 3rd, 10th, and 17th, 1872.

<sup>3</sup> Of the best *Succus* we have yet procured, it took fl ʒj to have decided physiological effect on myself and some of my colleagues, and I have taken as much as fl ʒjss of another *Succus* with only slight effect.

what annoying to find that, during the successful treatment of a case of mania with a good Succus, you are compelled to stop that form of treatment for a time, because a new supply of the Succus has turned out to be of little or no use ; and yet this has happened several times within our experience here. I need not stop to enquire into the cause of this variability in the strength of the Succus. Suffice it, for the present, to know that it *does* exist. Many factors, no doubt, contribute to this result, and, most probably, further experience in the preparation of the Succus will do much to remedy these inconveniences ; but, in the meantime, I have been induced to seek, in Conia—the alkaloid and active principle of the drug, a more stable preparation, and with what success the sequel will show.

I think we may safely assert that a preparation of any drug is of value, as to strength, in proportion as it contains a larger or less quantity of the active principle of the drug. Such being, obviously, the case, it is singular that active principles of drugs are not more commonly used than preparations which only contain, at most, a varying quantity of these principles. We are, doubtless, learning, day by day, to appreciate, more and more, alkaloids and active principles, on account of their stability, as to strength, and their unity of action ; but their powerful activity and our comparative ignorance as to the methods of preparing and using them to the best advantage, have, hitherto, been great obstacles to surmount. I am sanguine enough, however, to believe that our rapidly extending chemical knowledge, and the science of the future, will ultimately overcome these difficulties.

In commencing the use of Conia in the human subject, I was rather disheartened to find, from the statements of authors who have written on, and experimented with, this alkaloid, that it was considered to be unsuited for administration, either by the mouth or as a subcutaneous injection.

Conia, itself, has, besides its other effects, very powerful irritant properties. In dogs and cats, to which I have administered it internally, it has, in poisonous doses, caused full hemlock symptoms and a rapidly fatal effect ; but, at the same time, excoriation of the tongue, frothing and foaming at the mouth, and vomiting, were amongst the results. Even when neutralised



with acid and administered to dogs by the stomach, it causes, in poisonous doses, frothing at the mouth and vomiting. Schroff<sup>1</sup> seems to have been the only person who has administered Conia internally in the human subject. He gave Conia to three healthy human adults, in doses varying from  $\frac{1}{10}$ th to  $1\frac{1}{3}$ rd of a grain, and he found that the same symptoms as those produced by the fresh herb resulted; but, in addition, there was considerable gastro-intestinal irritation. These results would seem to indicate that Conia is quite unfit for internal administration, either alone or neutralised with acid. But I am far from being convinced that such is really the case, at any rate when the Conia is neutralised; for, though vomiting was caused in those dogs to which I so gave it in *large* and *poisonous* doses, yet the gastro-intestinal irritation, in those and in Schroff's cases, must, I think, after all, be referred to topical influences and extraneous circumstances (see p. 8); for such irritation forms no part of the symptoms exhibited by human subjects when placed well under the influence of good and pure Conia, by means of its subcutaneous injection, neutralised and in solution. I see no reason, therefore, why Conia, when neutralised and in bland solution, should not be administered internally, in therapeutic doses, without causing gastro-intestinal irritation, though I have not yet so tried it in the human subject.

Having thus resorted to the use of Conia as a *subcutaneous injection*, I did not derive much encouragement from the fact that I could find no record of its ever having been so used in the human subject, and the statement of Dr. Harley—that he could not produce hemlock symptoms in the horse by the hypodermic injection of Conia, either alone or neutralised with Acetic Acid. Dr. Harley,<sup>2</sup> in some experiments on horses, conducted by Messrs. Frederick and Mavor and himself, found that the subcutaneous injection of  $\mathfrak{m}\text{xiv}$  of Conia, dissolved in spirit and water, in one case, and of  $\mathfrak{m}\text{xvii}$ , neutralised with Acetic Acid, and diluted with spirit and water, in another, gave no results except an abscess in each instance; and Dr. Harley has shown that  $\mathfrak{m}\text{xvii}$  of Conia are equivalent to about  $\mathfrak{fl}\ \mathfrak{z}\ \text{xl}$  of the Succus Conii—quite sufficient to produce full hemlock symptoms in a young horse. I

<sup>1</sup> 'Reil, Mat. Med. der Chem., Pflanzenstoffe,' p. 135.

<sup>2</sup> *Loco cit.* p. 82.

can corroborate Dr. Harley's statement as to the inutility of pure Conia when subcutaneously injected; for a dog, weighing about fourteen pounds, under the skin of whose back I injected  $\text{mxx}$  of pure Conia, showed no hemlock symptoms (nor was any visible effect produced), and was living and well twenty-four hours afterwards. Conia, then, is, indeed, useless when given alone as a subcutaneous injection, and even if it did produce physiological effect when so given, its great topical irritant properties would prevent its being used in this manner. In accord with the experiments of Drs. Crum Brown and Fraser,<sup>1</sup> (who killed rabbits by the subcutaneous injection of the Hydrochlorate of Conia in solution) and contrary to those of Dr. Harley, I shall endeavour to show, however, in this paper, that, when neutralised with Acetic Acid and dissolved in spirit and water, Conia, as a hypodermic injection, acts both quickly and in a powerful manner, and that it may be thus used, in suitable doses, in the human subject, with good effect in subduing the motor excitement in cases of mania.

I commenced the use of Conia, as a subcutaneous injection in the human subject, with the following solution of it, which was recommended by Dr. Harley as of possible service (hypodermically injected) in cases of tetanus:—

Conia, 1 grain.

Alcohol,  $1\frac{1}{2}$  fluid-drachm.

Dissolve the Conia in  $\frac{1}{2}$  a fluid-drachm of the Alcohol, and add the remainder mixed with

Water,  $2\frac{1}{2}$  fluid-drachms.

$\text{mxx}$  of the solution =  $\frac{1}{12}$ th of a grain of Conia;<sup>2</sup> but, beginning with small subcutaneous injections of this solution on myself and others, and gradually increasing the dose, I found that so much as  $\text{mxx}$  of it, injected in two places at once, caused no effect except the smarting produced by the spirit. I had, therefore, to commence anew with a stronger solution, and determined to do so first *in corpore vili*.

Before going any further, I must first make the reader a little

<sup>1</sup> Trans. Roy. Soc., Edin., Vol. XXV., "On the connection between chemical constitution and physiological action." Part ii., "On the physiological action of the Ammonium bases derived from Atropia and Conia."

<sup>2</sup> *Loco cit.* p. 83.

more fully acquainted with the substance Conia, itself, as well as the method of its solution and use adopted by me; and, as far as possible, I shall speak of its physical properties and reactions, from my own experience of it.

CONIA (so called by Brandes) is the active principle of *Conium maculatum*—the *κώμειον* of the Greek writers, and the *cicuta* of the Roman authors. The following are the most common of its synonyms:—Coneine, Conine, Conein, Conicine, Cicutine, and Cicutia (Giesecke). The most recent writers on the alkaloid—M. M. Damourette and Pelvet<sup>1</sup>—call it “*cicutia*,” and designate its physiological effects “*cicutism*.” It was first procured, in an isolated form, by Geiger, in 1831,<sup>2</sup> who described some of its properties, and effects on animals. It was afterwards prepared, examined, and experimented with by Dr. Christison, in 1835.<sup>3</sup> Since then, its effects have been investigated and described by M. M. Boutran-Charlard and O. Henry,<sup>4</sup> Orfila,<sup>5</sup> Kölliker,<sup>6</sup> Paul Guttman,<sup>7</sup> Verigo,<sup>8</sup> and, more recently, by Schroff,<sup>9</sup> Drs. Crum Brown and Fraser,<sup>9</sup> and M. M. Damourette and Pelvet.<sup>9</sup>

Hugo Schiff<sup>10</sup> discovered that this substance can be built up, synthetically, by the action of Ammonia on Butyric Aldehyde:— $\text{N H}_3 + 2 \text{C}_4 \text{H}_8 \text{O} = 2 \text{H}_2 \text{O} + \text{C}_8 \text{H}_{15} \text{N}$ . It is best prepared from the seeds, or juice of the fresh fruit, and leaves of the *uncultivated* plant; and it can, of course, be procured from any respectable chemist. It costs from 16s. to 21s. per fluid ounce. It is an oily-looking translucent liquid, lighter than water, and varying in colour, from a rich sherry to a light amber; but it may be (as I have recently) procured quite clear

<sup>1</sup> See *résumé* of their work in the ‘Gazette Hebdomaire,’ Paris, Oct., 1871.

<sup>2</sup> ‘Mag. fur Pharm.,’ xxxv., 75 and 259.

<sup>3</sup> ‘Trans. Roy. Soc., Edin.,’ Vol. XIII.

<sup>4</sup> ‘Journ. de Chem. Med.,’ t. ij. 2nde ser. p. 530.

<sup>5</sup> ‘Annales d’Hygiene,’ 1851, ij. p. 147.

<sup>6</sup> ‘Verh. d. Phys. Med. Ges.’ zu Wurzburg, 1859, Vol. IX., part 2, p. 55; and Virchow’s Archiv., Vol. X., p. 235.

<sup>7</sup> ‘Berliner Klin,’ Wochenschr, Nos. 5 and 6, 1866.

<sup>8</sup> ‘Deut. Zeitschr. f. Staatsarznk,’ 28, p. 213.

<sup>9</sup> *Loco cit.*

<sup>10</sup> Liebeg’s ‘Annales,’ March, 1871.

and colourless, like water. It has a sharp alkaline reaction and a strong peculiar odour, resembling that of mice, and also, in my opinion, that of the pale and acrid nicotic juice which accumulates in the stem of an old pipe. It is soluble in dilute sulphuric acid, alcohol, and rectified spirit. The addition of either Acid. Sulph. Dil. or Acid. Hydrochlor. Dil. causes brisk effervescence with a little fuming; when Acetic Acid is added, there is less effervescence and more fuming. When neutralised with acid, it is soluble in spirit and water. I have received, altogether, ten samples of it, and with the exception of three—the most recently received—to be specially referred to hereafter, there has been little or no variability in the strength and active properties of the alkaloid. It and its solution should be kept in green-glass and well-stoppered bottles. When so kept, solutions of it do not seem to deteriorate much by keeping; for  $\frac{mij}{\text{of Conia}}$ , neutralised with Acid. Hydrochlor. Dil. and dissolved in spirit and water, injected under the skin of a cat, seven pounds in weight, killed it in one hour and fifteen minutes, the Conia being, at least, five months old, and the solution of it having been prepared about three months previously; whilst the same quantity, neutralised with Acetic Acid, and dissolved in spirit and water, and similarly administered, (both the Conia and its solution being fresh) killed a cat, weighing seven pounds two ounces, in one hour and ten minutes. The result of these two experiments would also tend to show, that it is immaterial whether the acid used for neutralising purposes be Hydrochloric or Acetic. That the Conia should be neutralised and rendered bland is essential, and it must, furthermore, be diluted with spirit and water, to make its solution of convenient strength for subcutaneous injection in the human subject. I have generally used Acid-Acetic. Fort. as a neutralising agent, and, with the specimens of Conia used by me, it almost always took about equal parts of Conia and Acid to produce a neutral or very faintly acid mixture. The acid must be added carefully and gradually until neutralization, or as near an approach to it as possible, is attained; litmus papers being used, from time to time, to determine the reaction. With the exception of a slight variation at times in the amount of acid required to produce neutralization, the following is the formula that I have generally adopted and

found most convenient, when making a solution of Conia for the purposes of subcutaneous injection :—

R Coniæ fl 3 iij, ℥xij.

Acid. Acetic. Fort. fl 3 iij, ℥xl.

Spirit. Vini. Rect. fl 3 j.

Aquæ Destillatæ ad fl 3 ij.

℥v of the solution = ℥j of Conia.

The acid must be added carefully as already directed, the mixture being stirred well with a glass rod from time to time. The spirit may be added by itself, and will mix readily on stirring, as will also the water when added afterwards. The resulting mixture is generally clear, but becomes slightly coloured or deepened in colour by keeping. Sometimes, before the full quantity of water is added, a slight turbidity will arise in the mixture, but this may be avoided by using a little more spirit, or remedied by the addition of a few drops of alcohol afterwards. It is important, however, to have as little spirit in the solution as possible, so that it may be the blander and less irritating. The solution might be still further diluted by the careful addition of spirit and water, but this would scarcely ever be found necessary for ordinary use; for I find that it takes more than  $\frac{1}{5}$ th of a minim of even the best Conia (or ℥j of the solution) to give any decided effects, when injected subcutaneously in the healthy human adult.

I have been thus particular in describing the solution, as I believe that a careful attention to these details is necessary for the successful use of Conia as a subcutaneous injection; and the reader will please to understand, that, where it is not otherwise stated in the course of this paper, the Conia has been injected, neutralised, and in solution, in accordance with the formula just given.

In order that some idea may be formed of the scope of my experiments, I may state that I have used, altogether, about *three fluid ounces* of Conia, and that the numbers of animals experimented upon will be given, under each heading, as I proceed.

#### PHYSIOLOGICAL ACTION OF CONIA ON THE LOWER ANIMALS.

##### *When Administered by the Mouth.*

In addition to what I have already stated, I might just say, that I killed in this way, four dogs, two rabbits, and one kitten.



I need not give the doses, for the frothing at the mouth and vomiting invalidated the results as to the amount required to kill. I know how much I gave, but can not tell how much of it was retained. I gave it both pure, and neutralised in solution. The gastro-intestinal irritation and topical effects were of course most marked in the former case. I can only explain the vomiting, after it had been administered in a neutralised condition, by the facts that the dose was large, the mixture nasty to the smell and unpleasant to the taste, and that the passage of the catheter down the throat caused irritation. The vomiting was most marked in the dogs; but they seem generally to have overloaded and irritable stomachs.

#### *When Dropped into the Eye.*

The following experiment was performed to corroborate the statements of former writers on this subject:—One drop of pure Conia was placed in each eye of a kitten, about ten weeks old: in five minutes, it could not stand erect, and could only drag itself about with great difficulty; in eight minutes, it lay on its side; in ten minutes, there were occasional general convulsive twitchings; in twenty minutes, it could scarcely turn off its back when placed on it; in one hour, it remained in any position in which it was placed, and was completely paralysed in its limbs, and helpless; occasional general twitchings occurred, but it retained, throughout, its consciousness and sensibility; two and a quarter hours after the Conia was dropped into the eyes, the kitten was still lying on its side on the floor, breathing rapidly, but somewhat better than it was at last report: as the conjunctivæ were now very red and much swollen, and the animal evidently very uncomfortable, four drops of pure Conia were placed on its tongue, which caused convulsions and death in three minutes.

#### *When Administered per Rectum.*

℥xv of a solution = ℥iij of Conia, neutralised and prepared according to my formula, were injected up the rectum of a rabbit about three pounds in weight, and the orifice of the anus immediately closed by stitching it up. None of the injection

was thus wasted, and effects began to show themselves in two minutes, and, going on to complete paralysis and convulsions, ended in death about fifteen minutes after the injection. A former injection of the same strength, in another rabbit, failed on account of the return of the injection, the rectum not being closed up.

*When Injected Subcutaneously.*

*Pigeons.*—I administered it to three pigeons, making the injection under the skin over the breast bone. One, seven and a half ounces in weight, died in seven minutes, after the injection of  $\text{m}\nu$  of my solution =  $\text{mj}$  of Conia. Another, twelve ounces in weight, died in ten minutes, after the injection of  $\text{mijss}$  of the solution, =  $\text{mss}$  of Conia; and the last, weighing eleven ounces, died in twenty minutes after the injection of  $\text{mj}$  of the solution, =  $\text{m}\frac{1}{5}\text{th}$  of Conia. The manner of action of the drug, in each pigeon, was as follows:—immediately after injection, it ran away to the furthest corner of the room, (one wing having been clipped short) and there stood for a time, varying according to the dose; but soon its legs gave way and it fell on its breast with its legs extended straight out behind it, and apparently stiff and rigid; in this condition it would slide along the floor on its breast, by means of the flapping of its wings; after a time, it became unable to flap its wings, and, inclining on one side, dropped the head and died; death being preceded by a gasp or two. No movements, beyond flapping of the wings, were observed, the legs remaining stiff and extended throughout.

*Frogs.*—Two frogs, about two ounces each, were injected under the skin of the back, with, in one case,  $\frac{5}{48}\text{ths}$  of a minim, and, in the other,  $\frac{5}{24}\text{ths}$  of a minim of Conia, neutralised with Acetic Acid and dissolved in spirit and water. The former injection had no effect whatever, the frog remaining as lively as before, when disturbed; but the latter caused the frog to lie for a short time afterwards on its belly, with its head depressed. In the case of another frog,  $\frac{5}{12}\text{ths}$  of a minim of Conia was administered in the same way, and, though lively and jumping about when put down, in a few minutes it sank on its belly, with its legs

sprawling under it, and its head depressed; it showed no signs of life, remaining in whatever position it was placed, and lay quiet under water when submerged. More than twenty-four hours afterwards, the animal was lying as it was left and apparently dead; but, on opening the thorax, the heart was found to be still beating regularly and distinctly; it made no movement or noise during the operation, and was afterwards destroyed. In the cases of two other frogs,  $\frac{5}{8}$ ths and  $\frac{5}{12}$ ths of a minim were administered respectively, prepared as before; and the results were the same as those just described, except that death was more rapid, and no movement of the heart could be detected on opening the thorax twenty-four hours afterwards. No convulsions or convulsive movements were observed in any case.

*Guinea-Pigs.*—mj of Conia, in solution as before, was injected under the skin of the back of a guinea pig, weighing one-pound seven ounces. Death took place thirty-five minutes afterwards, the symptoms being the same as those to be more fully described under the head of rabbits, except that the convulsions were later in appearing, and at the same time, more continued and severe.

*Dogs.*—I have already stated (p. 4) that mx of pure Conia, injected subcutaneously, had no effect in producing any visible hemlock symptoms. For two fatal cases of poisoning by Conia, in dogs, when given hypodermically, neutralised and in solution, I must, for the present, refer the reader to pp. 31 and 33. Conia does not, as a rule, cause well marked convulsions in dogs, merely occasional twitchings of the limbs occurring. The gradually extending paralysis of the limbs is much better observed in dogs than rabbits, the former remaining on their legs, standing or walking, so long as they are able, and the latter sitting; but, on account of the great difficulty in getting dogs, I have been obliged to experiment on rabbits principally, a good supply of which one can always procure.

*Cats.*—I experimented on four cats. Though better than rabbits for the purpose, they are not so good as dogs; for after the injection is made, they go and sit down in a corner as soon as a



short walk round has convinced them that there is no way of escape. I have already had to mention the effects of the subcutaneous injection of Conia, neutralised and in solution, in the cases of two cats, (see p. 6); and two other cats were killed more rapidly with smaller doses of another Conia, to be afterwards specially referred to (p. 31). The nature and progress of the symptoms are much the same in cats, as in dogs and rabbits, except that, in cats, there are distinct spasmodic and intermittent twitchings of the limbs, which do not, however, ripen into general convulsions, as in the case of the rabbit.

*Rabbits.*—Of these I used more than of any other animal, for the purpose of the experimental subcutaneous injection of Conia. In the case of one rabbit, I had the good fortune to administer just sufficient of the drug to produce full Conia symptoms or ‘*cicutism*,’ without causing death. This case is most interesting as illustrating the action of Conia; so I do not apologise for going into details concerning it:—To a healthy rabbit about three months old and weighing two pounds fourteen ounces,  $\text{m}_j$  of Conia, neutralised and in  $\text{m}_v$  of solution, according to my formula, was injected under the skin of the back; it remained pretty well until about seven minutes afterwards, when, on being put in motion, its hind legs were observed to be shaky and weak; the paralysis gradually increased, until, in thirteen minutes, the rabbit only struggled feebly when lifted by the ears, and, instead of sitting with its head up, its head was depressed, and it lay inclined to one side; when stirred, it could manage to get along with great difficulty, but, after a few movements, it rested apparently exhausted, lying down on its belly, with its chin resting on the floor; its ears were not now erect as before, but it could prick them up when a sudden noise was made; in fifteen minutes, it still lay on its belly, but the head was now inclined to one side, and, breathing rapidly, it appeared to be quite conscious and sensible; in eighteen minutes, after some slight convulsive twitchings of the limbs, it seemed to be worse and did not prick its ears when a sudden noise was made; from this time, up till one hour and eighteen minutes after the injection, it remained in this condition of complete prostration, lying on its side and being apparently conscious, but unable to

prick its ears, and having now and then, convulsive twitchings of the limbs, which, though occurring from time to time spontaneously, yet seemed, on several occasions, to have their exciting cause in some sudden noise, such as the opening of a door, movement of a chair, or poking the fire: the ears remained cool and the respirations about one hundred per minute; lifting it by the ears also caused general spasmodic twitchings, lasting for a few seconds, but, when put down, it remained in whatever position one chose to place it: one hour and eighteen minutes after the injection, after some general spasmodic twitchings excited by the sudden opening of a door, it got up off its side and reclined on its belly and chin again, and was evidently recovering, the head being occasionally raised and the ears pricked: general convulsive twitchings continued to go on intermittingly, and, one hour and twenty-four minutes after the injection, after some twitchings of the limbs, it seemed to be worse again, and laid its head on one side, but, within fifteen seconds, it raised it up again, and very soon sat up with the head erect and ears pricked: it now appeared much more lively and was sensitive to the slightest noise: one hour and thirty-three minutes after injection, it was rapidly recovering and could move about a little, though the legs were still weak and clumsy in action: it had, at this time, decided power over all its parts except the hind legs: one hour and thirty-seven minutes after injection, it was still more improved, and it could be lifted by the ears without convulsive twitchings resulting, none of which occurred after this: it struggled freely, however, when lifted by the ears, as all rabbits do: the power of the hind legs rapidly returned, and, about two hours after the injection, the animal was quite well, and as lively as ever, and could get about with its usual facility. This rabbit was kept under careful observation from the beginning to the end of the symptoms, and there was no vomiting or change in the pupils during the whole progress of the case. The rabbit was killed with a larger injection a week afterwards.

In the cases of several other rabbits, from two to three months old, I had fatal results, the doses varying from  $\text{mij}$  to  $\text{mx}$  of Conia, and the length of time, after injection until the supervention of death, varying from ten to sixty-three minutes. In some cases the Conia was dissolved in rectified Spirit, or dilute Sulphuric

Acid alone, and, in others, after being neutralised with Acetic or Hydrochloric Acid, it was dissolved in Spirit and water. The symptoms were much the same in character as those already described, differing only in their intensity and rate of progress to a fatal issue. Gradually extending paralysis affected first the hind and afterwards the upper extremities, and last of all the muscles of the neck and trunk. The convulsions were always ushered in by great warmth of the ears, which were generally cool at first. The twitchings first affected the hind legs, and were intermittent for a time, but gradually ripened into regular general convulsions. Death was ushered in by cooling of the ears and clonic spasm of the diaphragm. The heart was always the last organ to be affected, outliving the respiratory movements for two or three minutes in some instances. The last movements of all were rotatory and gyratory movements of the intestines and occasional fine muscular twitchings, and these often lasted for some considerable time after the heart had ceased to beat, being observed for a longer period in the cold than before the fire. My observations showed, that, as a general rule, the pupils were unchanged before the convulsions came on, widely dilated during their existence, and contracted at the time of death.

#### POST-MORTEM APPEARANCES IN ANIMALS POISONED WITH CONIA.

I made post-mortem examination of the head, thoracic organs, and kidneys, in almost every case.

*Head.*—Though the sinuses of the dura-mater were, in all cases, gorged with dark fluid blood, yet there was nothing demanding special notice in the appearance of the brain itself,—at least nothing of a positive nature. The brain of a dog, killed in twenty-two minutes, by pouring  $\text{m}x$  of pure Conia down its throat, contrasted strongly, not only with the brain of a sheep killed in the usual way, but also with that of another dog, killed by hanging, showing that it was neither anæmic nor congested, but in a condition midway between the two states, or, in fact, normal. Although these three brains have been kept in spirit for several months, they still contrast with one another as regards their vascularity.

*Thorax.*—The right side of the heart and the large veins were distended with dark fluid blood; whereas the left ventricle was contracted and more or less empty, in all cases.

The lungs varied, being generally of a uniform pale-pinkish or dirty-yellow colour; but some times one lung or both had brown patches, here and there, on the surface, giving rise to a mottled appearance. They were not uniformly congested in any case.

*Kidneys.*—There was generally more or less congestion of the cortical substance, and especially of the margins of the pyramidal bodies,—a well defined dark line being observed going round each pyramid, rendered more distinct by its contrast with the substance of the pyramids which was pale and glistening.

Rigor mortis was always well marked.

The whole appearances coincide in the main, therefore, with those usually observed after death by asphyxia; indeed, with the exception of some congestion of the pia-mater, they differed in no material respect from those observed in a dog which was hung, for the purpose of comparison.

#### THE PHYSIOLOGICAL ACTION OF CONIA, WHEN ADMINISTERED, AS A SUBCUTANEOUS INJECTION, IN THE HUMAN SUBJECT.

I have injected myself and twenty-two other healthy adults on fifty separate occasions, the doses varying from  $\frac{1}{12}$ th of a grain to  $2\frac{1}{5}$ th minims of Conia, neutralised and in solution according to my formula. Thus given, the effects were very uniform, differing only in intensity according to the weight of the person and dose injected. I was injected myself on thirteen separate occasions, the doses of Conia varying from  $\frac{1}{12}$ th of a grain to mjj. To thoroughly appreciate the effects of Conia, it is necessary that one should keep on the move after being injected, and I generally went and played at billiards or set off on a visit round the wards immediately after each injection, so as to have in action as many of my muscles and senses as possible, and thus be the better enabled to experience the effects of Conia on the motor centres, &c. I generally got only very slight effect before I reached a dose of  $\frac{3}{5}$ ths of a minim, and, of course, I ex-



perienced the most marked effects when I had  $m_{ij}$ . I had  $m_j$  twice,  $m_{jss}$  three times, and  $m_{ij}$  three times. As typical of the physiological effects of the subcutaneous injection of Conia in the healthy human subject, I shall just briefly describe those experienced by me after a dose of  $m_{ij}$ . My weight is  $10\frac{1}{2}$  stones:—

*March 7th, 1872.* My colleague, Mr. Wood, injected under the skin of my right arm  $m_x$  of a solution according to my formula =  $m_{ij}$  of Conia, and I went off immediately to play at billiards: there was considerable local smarting for a few seconds after the injection: in fifteen minutes, there was confusion of vision and slight weakness of the legs: in twenty minutes, there was some numbness with tingling of the arms as well, and the eye-lids felt heavy: in twenty-five minutes, the weakness of the legs and knees was more marked, and there was a certain amount of unsteadiness in my gait as I walked round the table: in thirty-five minutes, the numbness and weakness of both legs and arms were well marked, and I felt that I handled the cue awkwardly, and that, when standing still, there was an inclination to sway backwards and forwards, while the knees began to give way under me; my voice was now rather thick and I mumbled my words somewhat when speaking: in forty-five minutes, I was fast losing all interest in the game and doubted whether I could go on with it; but I managed to do so by dint of great effort: there was now much confusion of vision, and the weakness of both arms and legs was intensified: I could not now walk without swerving to one side or staggering: in one hour and ten minutes, I had finished the game at billiards and left for a walk; my legs were very stiff and awkward in motion, and it was just as much as I could do to get along. I had to progress slowly. There was a great feeling of calm and tranquillity, and some slowness of the mental processes, in fact all my movements were slow and laboured. I felt, with regard to my limbs, as if I was getting up to walk after a short rest at the end of a day's good pedestrianism, or as if I had just landed after a long swim; and, altogether, a quiet rest on the sofa would have been most acceptable to me. It was now only possible to get upstairs with

the greatest effort, and I did so in a very awkward manner, and often knocked my toes against the steps; but, strange to say, I felt it more difficult to go *down* than *up* stairs. When I sat down I had to let myself drop suddenly when within a few inches of the seat. As the sequel showed, the effects were now about their maximum intensity; but I continued to keep moving about. In one hour and thirty-five minutes, vision was almost right again, and the effects were generally diminishing in intensity; the feeling of calm and tranquillity was still great. In two hours and ten minutes, my limbs were rapidly regaining their strength, and vision was now pretty fair. In two hours and twenty minutes, the legs were nearly all right again, but the arms still weak. Three hours after injection, I felt quite well again, and could move about with ease as before injection, and I sat down and ate a hearty dinner, feeling none the worse for the experiment on myself. I experienced no nausea or faintness. Beyond some slowness without impairment, the mental processes were in no way interfered with; but it was impossible to read on account of the confusion of vision. On one occasion, besides the above symptoms, I experienced numbness of the muscles about the jaws, and a tendency to cramp in one of the calves.

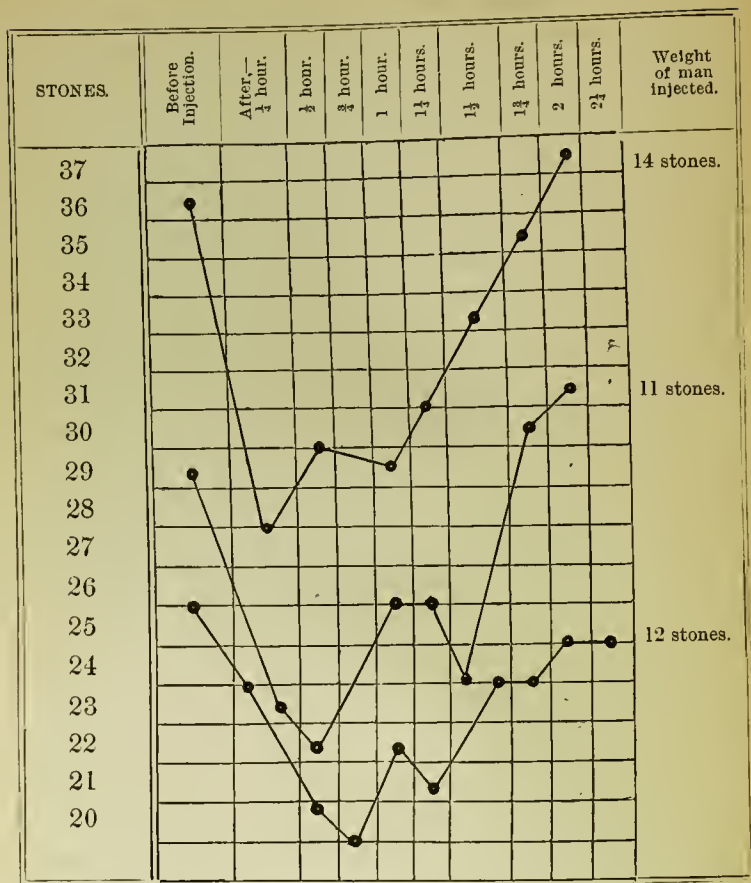
My colleagues—Mr. Wood, Dr. Courtenay, and Dr. Mitchell, and Mr. Beaumont—the chief attendant—kindly allowed me to inject them on several occasions. Mr. Wood was injected eleven times, the doses of Conia varying from  $\frac{1}{4}$ th of a minim to 2 minims;  $m_{ij}$  doses were given on two, and  $m_{jss}$  doses on three, occasions. Dr. Courtenay had three injections, the doses varying from  $m_{\frac{2}{3}}$ ths to  $m_{jss}$  of Conia. Mr. Beaumont was injected three times with doses of  $m_{jss}$ ,  $m_{ij}$ , and  $m_{ij}$  and  $\frac{1}{5}$ th respectively.

The rest of the injections administered, for the purpose of observing physiological effect, were given principally, in single doses of  $m_{ij}$ , to attendants and male patients in good bodily health. The Conia was in all cases given neutralised, and in solution, according to my formula. The effects, of course, varied in intensity, with the weight of the person and dose injected; but were, in the main, much the same as those described as occurring in myself. Some complained more of giddiness than I had reason to do. Perhaps some of the effects of Conia will

be better understood if I just give a few examples of the literal statements made by some attendants and healthy patients to whom I administered it subcutaneously in  $\text{mij}$  doses:—One attendant said that he felt as if he had been “up all night on special extra night duty, and should like to go to bed;” another said his “legs felt as if they weighed a ton;” one patient said he felt as if he “had been fashed (*sic*) a bit night before, and tired like;” another felt as if he “had been working hard all day.” Another attendant intimated that his “legs felt independent, and as if they didn’t care for him or anybody else.”

In all cases the effects came on in from five minutes to a quarter of an hour, and, reaching a maximum intensity in one or one and a quarter hour afterwards, gradually passed off, being entirely gone in about three hours after injection. The pupils, in all cases, were watched, but appeared to remain unchanged. In only one case did vomiting occur, and in one or two others there was a slight feeling of nausea with the giddiness; but in none was there any faintness, pallor, or disturbance of the circulation; nor did the digestive functions become interfered with in any way.

No means were at hand for testing the exact loss of power in the legs; but, by the use of “Salter’s improved dynamometer,” I was enabled to measure, pretty accurately, the loss of power in the arms and muscles of the back. On two occasions I took seven healthy adults, and, previous to injection, made them exert their utmost strength in pulling the handle of the dynamometer. I then injected each with  $\text{mx}$  of a solution according to my formula =  $\text{mij}$  of Conia, and made them pull at the dynamometer every quarter of an hour for two and a quarter hours afterwards. The following woodcut exhibits charts (obtained from three different persons) typical of the results that I got. The rapid loss of power after injection, and the gradual return to the *status quo*, as the effects of the drug pass off, are alike well shown. The amount pulled is given in stones and halves of stones:—



### THERAPEUTIC EFFECTS OF CONIA USED AS A SUBCUTANEOUS INJECTION.

I have used Conia in subcutaneous injection, as a therapeutic agent, in the cases of twenty-one patients—only six of whom were females—in doses varying from  $\frac{1}{10}$ th of a minim to 3 minims. These have all (except one) been cases of mania in which there was great motor excitement. Most of them were treated with Conia from the very first—no other drug being used—but, in a few cases, various other drugs had been previously tried without good effect. The Conia was always injected neu-



tralised and in solution according to my formula, and the injections were made in the arm, when the patient was up, and between the shoulder blades, when he was in bed. It was very rarely that any consequent redness appeared at the site of an injection, and, on only two occasions, did I observe a small abscess at the part injected, and, in both instances, the abscess rapidly discussed itself. I must, however, state that very often the skin, in the neighbourhood of a recent injection, assumes a yellowish appearance, very much resembling that of an old bruise. This discoloration, of course, varies in intensity according to the depth of colour of the solution used—to which it is, no doubt, due. As I have said before, solutions of Conia tend to become deeper in colour the longer they are kept, and even colourless Conias (two specimens of which I have recently received) assume a certain colour when neutralised and in solution. Excepting a smarting for a few seconds, and some slight soreness of the arm for a few hours afterwards, I have experienced no bad local effects after thirteen injections in my own person. In four cases in which the injections were continued twice or thrice daily for periods of four, six, and eight weeks respectively, there were, with the exception of slight soreness and redness occasionally, no injurious local effects. If anything of the kind does occur, the skin presents a very large field of sites suitable for purposes of subcutaneous injection, and they could be changed accordingly. The best way of avoiding consequent local irritation is to be careful in making the solution as bland as possible, and also to change the site of injection from time to time.

Several of the patients had merely single and tentative injections, and, in some, where the dose was inadequate, no benefit accrued; whilst, in others, where larger doses were given, rest and quiet, for the time, were obtained.

The most suitable cases, for the subcutaneous injection of Conia, are those of acute mania in which the motor excitement is great, and where the patients will neither take food nor medicine themselves, but require to have both passed into the stomach by means of the stomach pump. Many of this class of patients vomit their food (and of course their medicine, given at the same time) immediately after feeding with the stomach pump;

hence the value of subcutaneous injections in their cases; to say nothing of the more speedy remedial effect obtained in this manner. I have not, however, confined my use of Conia, in subcutaneous injection, within these limits; but have used it in various cases of mania—acute, chronic, and recurrent—in which the motor excitement was great and threatening to produce exhaustion.

The number of cases, in which I have used Conia therapeutically, as a subcutaneous injection, for any considerable period of time, may be reduced to nine, and of the results in these cases, I shall now proceed to give short details. They were all males, and the injections were made twice or thrice daily for varying periods, the dose of Conia, at first, being small, but rapidly increased to an adequate amount.

CASE 1.—No. in Register, 6087.—Ætat. 23. Single.—A case of suicidal mania occurring in the progress of melancholia. Admitted Jan 27th, 1872, in weak bodily health, and deformed by hump-back. He is stupid and lethargic, and has to be fed with a spoon and attended to like a child. He appears to be absorbed in melancholy, and will not speak. He was at once put on the Syrup of the Phosphates of Iron, Quinine, and Strychnia, and ordered extras. He remained in the condition just described until Feb. 18, when, after a restless night, he became acutely suicidal, and seemed to be most determined to kill himself by knocking his head against the wall, or precipitating himself head first against the floor. On one occasion, at the outset of the attack, he did succeed in inflicting a scalp wound, by jumping up suddenly and unexpectedly and throwing himself head first against the floor, and, after this, he had to be restrained during the day by two attendants and placed in a padded room at nights. He had also to be fed with the stomach pump three times a day. For three days he was treated with ℥℥xx of Tinct. Belladonnæ, given every four hours, but without good effect. On Feb. 21st, therefore, treatment by the subcutaneous injection of Conia was resorted to, and the Iron and Belladonna mixtures stopped. Injections were commenced with ℥℥ $\frac{1}{4}$  doses of Conia, and half hour after the first injection he became quiet, and remained so for three hours. The injections were continued up to Feb. 28th, in doses varying from  $\frac{1}{4}$  to  $1\frac{1}{2}$  minims, two or three times a day, according to the amount of motor excitement; and there was, as a rule, marked quiet, coming on from twenty to thirty minutes after each injection and lasting from two to three hours. Besides the immediate good effect after each injection, there was a steady improvement in patient's condition, so that, on Feb. 28th, injections were stopped, and he was placed in an ordinary bed and room at night, and took all his food himself. From that time up to the present (May 23rd) he has remained quiet, and, except that he now takes all his food himself, he continues in the same dull and lethargic condition as he was before the attack of excitement commenced. The *propter hoc* was very clear, to my mind, in this case, such marked quiet following each injection that the attendants in the

ward were always glad, after the effects of one injection had passed off, when the time for another came, and, moreover, the improvement and diminution of motor excitement were gradual and steady after the injections were commenced.

CASE 2.—No. in Register, 6035.—Ætat. 40. Married.—Admitted Sept. 28th, 1871, in a state of maniacal excitement—being destructive and dirty in his habits, and very abusive. On Sept. 29th, he was ordered grxxx Pot. Bromid with fl 3 ij Tinct. Cannabis Indicæ, three times a day. This mixture he continued to take up till Oct. 3rd, when, being unimproved and refusing to take his medicine, subcutaneous injections of Morphia were ordered instead. These had a good effect for a few days, but, on Oct. 20th, were stopped, as they seemed to have lost their effect in ordinary doses of  $\frac{1}{2}$  or  $\frac{1}{4}$  of a grain two or three times a day, and the Cauuabis and Bromide mixture was resumed instead, which with great difficulty he was got to take. On Nov. 7th, he was no better, but took his food well. On Nov. 28th, being still very destructive, dirty, and troublesome, especially at nights, the Cannabis and Bromidenixture was stopped, and he was ordered, instead, gr $\frac{1}{2}$  Antimonii Pot. Tart. in fl 3 iv Infusi Digitalis three times a day. This treatment had a good effect for a few days, but, soon afterwards, failed seemingly to affect his mental condition. However, on Jan. 3rd, 1872, having taken the Antimony and Digitalis mixture at intervals, since last report, he was so far improved that, though restless, destructive and dirty during the night, he was tolerably quiet and manageable during the day. This mixture was uow stopped, and, strange to say, it at no time gave rise to weakening of the pulse, vomiting, or interference with the digestive functions. From Jan. 3rd to Feb. 7th, he took no medicine, and remained in the same condition, being fairly quiet and tidy during the day, but restless, noisy, destructive, and very dirty at nights. On Feb. 7th and 8th he was much worse, and had to be secluded on account of his violence and threatening language to the attendants; but, after this, he lapsed into his old condition. On Feb. 18th, many drugs having been already tried without permanent good effect, and rapid emaciation, &c., appearing, indicating approaching exhaustion, patient was put under treatment by the subcutaneous injection of Conia, and, as he was tolerably quiet during the day, the injections were generally given only once a day, at 10 p.m. each night. The injections were continued up to Feb. 26th, in doses varying from  $\frac{2}{3}$ ths to  $1\frac{1}{3}$ ths of a minim of Conia, and, though noisy and destructive before each injection, he generally quieted down afterwards till about 3 a.m., when he commenced to be noisy and restless again; but a steady improvement took place, and, on Feb. 24th, he was quiet all night for the first time during a period of several months, and not destructive. On Feb. 29th, marked improvement was maintained. Later on he was sent out to work, and rapidly became quite well, having gained much flesh. He is now (May 23rd) on the convalescent list, and makes himself most useful outside.

CASE 3.—No. in Register, 6066.—Ætat. 57. Married. Third attack.—Admitted Dec. 11th, 1871, in a state of excitement, being restless, talkative, and extravagant in his ideas. He was ordered fl 3 iij of the Succus Conii *ter die*. Dec. 14th, the dose of the Succus has been gradually increased to fl 3 vj, but there is no improvement in patient's condition; indeed he is worse and has

to be fed with the stomach-pump. Stopped the Succus, which has turned out to be of inferior quality, and ordered, instead, grxxx Potassii Bromidi, combined with fl 3 ss Tinct. Cannabis Indicæ, *ter die*. Jan. 18th, 1872 : Remains unchanged—is restless and excited both by night and day, and has to be fed with the pump ; but occasionally he is quiet for a few hours and will take food from the spoon—though nothing but liquids. He is looking pale, and is rapidly emaciating. The Cannabis and Bromide mixture was stopped, and he was ordered, instead, fl 3 vj of the Succus Conii, combined with fl 3 ij of the liquid extract of Ergot,<sup>1</sup> thrice daily. This had a good effect for several days, and he became quieter, and took all his liquid food and stimulants himself ; but, on Jan. 28th, a relapse took place, and he was as bad, if not worse, than ever—the excitement being very great and very persistent. He remained in this condition up to Feb. 16th, when the Succus Conii and Ergot mixture was stopped, and treatment by Conia, subcutaneously injected as before, commenced. He was under this form of treatment from Feb. 16th to April 1st, the doses of Conia injected varying from ʒi to 2½ minims, once, twice, or thrice daily, according to the amount of motor excitement. A dose of ℥ijss was only given on one occasion, and the average dose was about ℥jss. I got little or no good effects till a dose of ʒi was reached, and then I carefully increased the dose till the desired effect was produced. He soon commenced to be quiet for some time after each injection, and, when I reached the larger doses, this effect was most marked. A steady improvement, as to motor excitement, took place ; but he continued to refuse his food up till March 1st, when he commenced to take it himself. His restlessness now was principally confined to the small hours of the morning and other times in the day when the effects of previous injections had gone off. About March 12th, he commenced to be quiet all night, and, after that, rapidly improved and gained flesh. On April 1st, all motor excitement had disappeared, and since then up to the present (May 24th) patient has been quite quiet and very useful as a ward-helper. He is now quite stout, but his extravagant ideas remain, and he is always very self-satisfied and pleased.<sup>1</sup> There are no physical symptoms of general paralysis in this case. It is a well marked case of the '*folie circulaire*,' patient having been, for about ten months before his last admission, in a low and depressed state of mind, whilst, on a former occasion, when in the Asylum, he was excited.

CASE 4.—No. in Register, 4852.—Ætat. 63. Single.—Has been 6 years in the Asylum, and is subject, at intervals, to attacks of severe and prolonged excitement, generally lasting about two months, and leaving him much emaciated and almost exhausted. The present attack of excitement commenced on Feb. 22nd, 1872, after a quiet and lucid interval of eight or nine months. This attack is, like former ones, characterised by great motor excitement—he jumps about, stamps his feet, claps his hands, and shouts much, both night and day. Treatment was at once commenced by subcutaneous injection of Conia, in solution as before, and continued up to March 14th, the doses varying from ℥ss to ℥ij of Conia, twice or thrice a day. In a few days, when doses of ℥j and ℥ij had been reached, improvement commenced, just as described in the

<sup>1</sup> June 18th.—Patient has rapidly improved in mental condition since last report, and is now on the convalescent list.



other cases. On March 14th, all motor excitement had passed away, and he had become quite quiet and rational, and rested well at nights, and, excepting on two occasions when he was a little excited for a few hours, he has remained quiet and well up to the present (May 24th), and has latterly resumed work in the ward. He had not time to emaciate on this occasion, the duration of the acute excitement having been cut down from two months to about three weeks. The immediate good effects after injections of  $\mathfrak{Mjss}$  or  $\mathfrak{Mij}$  were exceedingly well marked in this case, sleep for an hour or so often resulting after the morning injection, although, just before it, he might have been very restless and much excited.

CASE 5.—No. in Register, 6075.—Ætat. 30.—Single. Not first attack. —Admitted Jan. 2nd, 1872, in a state of great excitement. Ordered  $\mathfrak{f}3iv$  of the Succus Conii, three times a day. On Jan. 4th, being no better, the dose of Succus was increased to  $\mathfrak{f}3j$ , and, on Jan. 8th, to  $\mathfrak{f}3jss$ , and, after this, improvement was decided and rapid, so that, on Jan. 14th, he was quite quiet and rational, and made himself useful in the ward. He now appeared to be convalescent and the Succus was stopped; but, on Jan. 23rd, there was a relapse of excitement, as before, and he was at once ordered to resume the Succus Conii, in doses of  $\mathfrak{f}3j$  three times a day. On Feb. 1st, there being no improvement, the doses of the Succus were increased to  $\mathfrak{f}3jss$ , and on Feb. 7th, to  $\mathfrak{f}3ij$ , three times a day. From Feb. 7th to 21st, he had  $\mathfrak{f}3ij$  of the Succus Conii three times a day, but was no better—being restless and destructive at nights, and troublesome and untidy during the day. The Succus Conii was now stopped, and treatment by subcutaneous injection of Conia commenced. He was under this form of treatment from Feb. 21st to April 16th, the doses of Conia varying from  $\mathfrak{M} \frac{1}{6}$ th to  $\mathfrak{Mij}$  twice or thrice a day, according to the amount of motor excitement. He had a dose of  $\mathfrak{Mij}$  on one occasion only. There was often marked effect after the injection, and he became stupid and quiet, and used to say concerning the injections, from time to time, that they made him “drunk.” About March 5th, he commenced to be quiet and in bed all night, and not destructive, and on March 12th, (having hitherto been placed in a strong room in ticking at night) he was allowed to sleep in an ordinary room and bedding. From that time up to the present (May 24th) he has remained quiet and in bed every night, and has never been destructive, and, though there is little improvement in his mental condition, he is now free from any considerable motor excitement. The good effects in this case of the Conia have been entirely confined to subduing the motor excitement, and thus causing great saving from the prevention of destructive habits, and warding off emaciation and exhaustion. He has, at times, been fairly rational of late, and I have good hopes of his complete recovery in a short time.

CASE 6.—No. in Register, 6090.—Ætat. 58. Single.—Admitted Feb. 15th, 1872, in weak health and poor bodily condition. He was much excited, talking or shouting, throwing his arms about or clapping his hands almost incessantly, night and day, and he was fed with great difficulty. He was at once put on treatment by Conia subcutaneously injected as before, and he was under this form of treatment up till April 16th, the doses of Conia varying from  $\mathfrak{M} \frac{1}{6}$ th to  $\mathfrak{Mjss}$ , two or three times a day. The usual doses were  $\mathfrak{Mj}$  or  $\mathfrak{Mjss}$ . Good effects soon showed themselves in diminution of the restlessness at

nights, and some considerable subjugation of the excitement during the day. Since April 16th, he has always remained quiet and in bed at nights, and has been much quieter during the day; but latterly (May 24th) he has become more excited during the day, and been put under treatment by *Succus Conii*. On account of patient's age and weak condition, I never ventured to give him what I would have considered adequate doses of Conia, and to this fact, I attribute the comparative want of success in his case.

CASE 7.—No. in Register, 6091.—Ætat. 16. Single. Not first attack.—Admitted Feb. 15th, 1872, being much excited, and restless and noisy at nights, as well as destructive—smashing and tearing. He was treated from the first with subcutaneous injections of Conia, the doses varying from  $\frac{1}{12}$ th of a grain to  $\frac{1}{3}$ th of a minim, twice or thrice a day. Treatment in this manner was continued up till Feb. 19th, when, after rapid improvement, all motor excitement had passed away, and the injections were discontinued. The lad would not speak, however, for a time; but after this rapidly got well, and, on Feb. 26th, he was quite well, and working a sewing machine in the tailor's shop. I am doubtful as to whether I may justly attribute the amelioration, just described in the case of this patient, to the Conia; for the doses given produced no physiological effect on myself whatever, and I must confess that I am rather sceptical as to the production of therapeutic effect before physiological action is obtained. It was not long, however, till the lad had a relapse; for on March 8th, after working steadily for ten days in the tailor's shop, and being otherwise quiet and rational, he struck work and became excited, noisy, and destructive. I was now enabled, after further experience with the drug, to give him doses of Conia, which I knew would produce physiological effects in my own person, and he was under treatment again by the subcutaneous injection of Conia, from March 8th to 14th, the doses this time, varying from  $\frac{1}{3}$ th of a minim to  $1\frac{1}{2}$  minims of Conia. The usual injections were  $\mathfrak{Mj}$  or  $\mathfrak{Mjss}$ ; but I had to commence cautiously on account of the age of the patient. He had on one day two injections equal to  $\mathfrak{Mjss}$  of Conia each. This time there was often immediate improvement after the injections, and, steady amelioration taking place, he was, on March 14th, quite free from motor excitement again. He remained in a taciturn condition for a day or two, however, as before; but after that, rapidly improved, and, on March 21st, was again quite well and working in the tailor's shop. Having, in the interim, remained well, he had on April 7th another relapse, and was injected twice daily with  $\mathfrak{Mj}$  or  $\mathfrak{Mjss}$  doses of Conia from that time up to April 18th, when, after steady improvement, he again became quite well, and resumed work in the tailor's shop. From that time up to the present (May 24th) he has remained well and made himself exceedingly useful in the shop.<sup>1</sup>

The Conia seems to have had a strange effect in this case, in causing what we know, from his former history, would have been one prolonged attack of excitement, to be split up into three, each of short duration, with intervals of quiet and usefulness.

CASE 8.—No. in Register, 6119.—Ætat. 38. Married. Bonesetter. First attack—the assigned cause being excessive drinking.—Attack commenced

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<sup>1</sup> June 18th.—Patient still remains well.

about five weeks before admission, and he gradually became worse, so that, for three weeks previous to admission, he was tied down in bed, and it required five or six persons to look after him—he was so very violent and destructive. During this time, also, he had taken very little food—only a little tea or beer and a few spoonfuls of bread and milk daily. On admission (April 9th) he was much excited—being very restless, and singing and talking gibberish in rapid sequence. Though his movements were very powerful and continued, and he was in good condition, yet he was pale and his pulse was weak, and exhaustion or death by syncope was much dreaded. He was put on extras of eggs and milk, and was ordered to be fed frequently, and, in the meantime, if he could be got to take a good quantity of nutrients, alcoholic stimulants were to be avoided. Medical treatment by the subcutaneous injection of Conia, in solution, as before, was at once ordered to be commenced (the motor excitement being so very great) with  $\frac{1}{2}$  doses of Conia, twice or thrice a day, increasing the dose if necessary. He was under treatment in this way from admission (April 9th) till April 30th, the frequency and amount of the doses varying according to need. The doses used were generally of  $\frac{1}{2}$  each; but he had, on three occasions, doses of  $\frac{1}{4}$  each. He was at first put in a padded room at nights, and kept in bed during the day by constant attendance. There was generally immediate effect after each injection, and an almost steady and gradual improvement, both as to motor excitement and mental condition. Except on one or two occasions, he generally could be got to take his food and extras himself, or could be fed with the spoon. In about four days, it was possible to dress him and get him up, and manage him when up; but he had occasionally to be put to bed again for a day or so when the excitement became aggravated for the time. In about ten days, he was up all day and out airing, and much quieter at nights, and at times fairly rational when spoken to. He now only occasionally talked gibberish, and his excitement was principally confined to eccentric and twisting movements of the neck and body. On and after April 23rd, he remained quiet every night, and during the day took his ordinary food pretty well, besides some extras. He gradually became more quiet and rational during the day, and the injections were gradually discontinued, and have not been repeated since April 30th—from which time up to the present (May 24th) he has been quite quiet and rational, and he is now on the convalescent list and will be discharged soon.<sup>1</sup> The effects of the Conia, in this case, were well marked, and it was observed that, as the motor excitement diminished, so the patient became more and more rational—the complete subdual of the motor excitement and return of reason being synchronous events; but, excepting patient's statement, now, that the injections often made him feel drunk, I could not say that there was any immediate effect on the *mental* faculties after each injection. This was a very favourable case for the use of Conia, and the recovery in twenty-one days was also a comparatively speedy one, and is to be attributed to the facts that—being in good bodily condition and in a state of great motor activity, full doses of the Conia could be administered to the patient and continued, and the possibility there was of getting him to take the requisite amount of nourishment, which, moreover, did away with the necessity for the use of alcoholic stimulants, objectionable in his case, considering the

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<sup>1</sup> This patient was discharged recovered on June 5th last.

cause of the attack. There can be no doubt that, though the cause was excessive drinking, this was a regular case of *acute mania*, and not *simple alcoholism*—from which recovery might have taken place by the administration of nutrients alone, with abstinence from alcoholic stimulants; for there were no frightful illusions or hallucinations in his case, merely simple, though very violent, maniacal excitement existing, under circumstances demanding active treatment.

CASE 9.—No. in Register, 6122.—Ætat. 42. Married. Brewer's labourer. First attack. He had a severe blow on the head several years ago, and has been, for a long time, addicted to excessive drinking, to which causes his insanity is ascribed.—Attack commenced about a fortnight before admission. On admission, April 16th, 1872, he was very much excited—being very restless and talkative, and, as to bodily condition, very thin and feeble. He was at once put on extras of beef tea, eggs, and milk; and medical treatment with subcutaneous injections of Conia commenced. He was under this form of treatment, more or less, from admission until quite recently—May 21st—and the doses of Conia given have varied from  $\mathfrak{M}\frac{3}{4}$ ths to  $\mathfrak{M}\frac{1}{2}$ ss, according to circumstances. There has often been decided and marked quiet produced after individual injections; but there has been no permanent improvement, and, indeed, patient is now—May 24th—as bad as ever with regard to mental condition, and has latterly been so weak that I have ceased injecting him. It has turned out to be a case of serious *organic* brain mischief, (of which he has at present all the general aspect), and not suitable for treatment with Conia. His present condition is very variable—for a day or so he will be quite quiet and stupid, and then, for a few days, he will be much excited. The prognosis, in his case, is bad—either a gradual subsidence into confirmed alcoholic dementia, or death from exhaustion, which latter mode of death we are at present endeavouring to avoid by the free use of stimulants and nutrients. My want of success, therefore, in this case, I attribute to the facts that the disease of the brain, in his case, is *organic* and not *functional*, and that, on account of the frequent verging on exhaustion, I have not ventured to press the use of the Conia so regularly and largely as I should otherwise have done.

#### FURTHER REMARKS AS TO THE ACTION OF CONIA.

Conia, when injected subcutaneously, seems to me to have little or no direct influence on the mental faculties, though, indirectly, the effects on the brain are considerable; but Schroff (*loco cit.*), who administered it internally, states that, a short time after the poison is taken, it is followed by a feeling of heaviness of the head with giddiness, inability to think, great impairment of common sensibility, blunted taste, dimmed sight, dilated pupils, and a sensation as of insects crawling over the skin. The action of Conia, in poisonous doses, is of a two-fold nature,—as has been shown by Drs. Fraser and Crum Brown (*loco cit.*) in their experiments on animals with it, con-



sisting of, firstly, paralysis of the motor nerves, commencing at the periphery, and, secondly, paralysis of the reflex function of the spinal cord: the former part of the action would seem to be due to the "*Conia*" and the latter to the "*Methyl Conia*" (see p. 28) contained in the alkaloid. Unless, however, there be a morbid excitability of the reflex function of the spinal cord, this function does not seem to be interfered with after the use of the drug in therapeutic doses. What Dr. Harley (*loc. cit.*) says of Conium is equally true of Conia—"that it exerts its power chiefly, if not exclusively, upon the motor centres within the cranium." The *corpora striata* are the parts principally affected, and, as Dr. Harley puts it, the whole motor function, of a person under its full influence, is "actually asleep" for the time. It creates an appetite for sleep by causing a general feeling of lassitude and tranquility, and heaviness of the eye-lids. It seems to soothe that irritability of the over exerted muscles which no doubt exists in cases of maniacal excitement and great motor activity, as it has been alleged by Galton, in his work on '*Hereditary Genius*,' to exist in athletes, often causing them to be restless and unable to endure repose. By subduing motor excitement, it tends to avert emaciation and exhaustion. Unless its use leads to sleep, however, it does not seem to cause much mental repose, and if a patient is very talkative, it leaves the tongue unaffected. Treatment by Conia, alone, is almost purely expectant, with regard to the mental excitement in cases of mania,—what we do is to assist the *vis medicatrix naturæ* by lessening and controlling motor excitement, and thus preserving the bodily strength of the patient; whilst, at the same time, the digestive functions being in no way interfered with, we can leave the rest to careful nursing and a liberal diet. Conia, on account of its not causing congestion of the brain or headache, and its not interfering with the digestive and circulatory systems, may be used in many cases where the use of other sedatives would be contra-indicated. The doses should be administered not in proportion to the *muscular strength* of the individual, but to his *motor activity*,<sup>1</sup> for the greatest tolerance of Conia exists in those cases where the

<sup>1</sup> With regard to this, I can fully corroborate the statements of Dr. Harley, from my experience of the use of the Succus Conii as well as the Conia itself.

motor excitement is at a maximum. I have often hastened the disappearance of the hemlock symptoms, in myself, after an injection of Conia, by keeping in motion, whilst, on the other hand, the effects are more prolonged when it is given to a person in a state of rest.

#### THE VARIABILITY OF CONIA.

As I have said before, I started with the expectation of finding, in Conia, a preparation of stable and uniform strength; but I must say I have been disappointed in that respect. I have, nevertheless, by careful previous experimentation, been enabled to use Conias in doses proportionate to the effects produced by them in the healthy human adult. The specimens of Conia, that have varied, have not been used by me for the purposes of this paper, except in so far as I have ascertained their variability and strength by experimenting with them on animals and the healthy human adult.

Drs. A. Crum Brown and Thos. R. Fraser (*loco cit.*), in their experiments on animals with two separate specimens of Conia, found that, though the symptoms produced by both were very similar in character, yet the difference in lethal activity between the two samples was very great. One of the samples they used was part of the original Conia prepared by Dr. Christison, in 1835, and used by him in his experiments; the other was obtained from Mr. Morson. They found that  $\frac{2}{10}$ ths of a grain of the hydrochlorate of the former sufficed to cause death when injected subcutaneously in a full-grown rabbit, whilst, of the latter, this dose did not produce any distinct effect on, and 1 gr. of it was the smallest fatal dose for, a full-grown rabbit. Von Planta and Kekulé<sup>1</sup> have shown that Conia, as obtained from *Conium Maculatum*, is a variable mixture of two bases, to which they have given the names of "*Conia*" and "*Methyl Conia*." Drs. Crum Brown and Fraser, after chemically examining the two specimens of Conia just referred to, found that *Methyl Conia* was much more abundant in Morson's than Christison's Conia; but the comparative feeble potency of Morson's, as compared with Christison's, cannot, they think, be explained by the fact

<sup>1</sup> 'Annalen der Chemie. und Pharmacie,' Vol. LXXXIX., 1854, p. 129.

that it contains a large proportion of *Methyl Conia*; for the activity of that substance is about the same as that of Christison's Conia, and they think it may be due to Ammonia, to which Conia is chemically allied.

I have received ten separate lots of Conia from six different sources, amounting, altogether, to about four and a half fluid ounces. The seven lots first received are those which have been used by me for the purposes of this paper, and they have been tolerably uniform in strength and activity, being very similar in lethal activity to Mr. Morson's Conia; for, as we have seen,  $\text{mij}$  of it injected subcutaneously (neutralised and in solution) under the skin of a rabbit, weighing two pounds fourteen ounces, caused full Conia symptoms, but did not lead to death (see p. 11), whereas  $\text{mij}$ , similarly given, produced death in seventeen minutes. I experimented on myself with each specimen of Conia before using it in any other human subject, and am thus, as well as from corroborative experiments on others, enabled to speak with great certainty as to the strength of the various Conias used by me. The three lots of Conia most recently received have differed remarkably from the seven previous lots, and it will be necessary for me to show what these differences are.

The first I shall refer to was the second lot of  $\text{fl 3 iv}$  from Messrs. Duncan and Flockhart, of Edinburgh; it was quite pale and clear, and not of such an acrid mousy odour as the preceding seven lots. Two minims of this Conia subcutaneously injected (neutralised and in solution as before), had little or no effect on myself, and, having got the same result with it in the cases of three other healthy adults, I had to place it on one side as useless. I wrote to Messrs. Duncan and Flockhart, asking them if they could explain the inefficacy of their second specimen of Conia, as well as its remarkable difference, in this respect, from the first lot they had sent us, which was of a pale sherry colour, strong mousy odour, and one of the seven previous lots I had used and found to be of uniform strength (Morson's). They kindly replied, informing me that both specimens were manufactured by Messrs. Morson and Son, of London, and that the probable cause of the difference between the two lots was—the preparing of the second specimen from the cultivated plant, as “cultivation completely destroys the medicinal properties of

Conium." On making further inquiries of Messrs. Morson and Son, they tell me that it is possible Messrs. Duncan and Flockhart have received from them, on one occasion, a specimen of Conia not of their own manufacture, when they were themselves out of stock. Contrary to my experience (with regard to strength), Messrs. Morson and Son think that Conia is a "preparation which is liable to change by keeping;" but on testing a sample of ten minims "recently prepared," which they very kindly sent me, I find that it is not so powerful as some I have already kept for several months, and by no means equal in strength and activity to that got from them on a former occasion, through Messrs. Duncan and Flockhart, and that supplied by them to Drs. Crum Brown and Fraser.<sup>1</sup>

The second of the varying specimens of Conia that I shall refer to, was a second lot of fl 3 ij, from Messrs. Davy, Yates, and Routledge, London, differing only, in appearance, from their first lot by its being of a deeper colour. It was of a rich brown sherry colour, very acrid and mousy, and exceedingly powerful in its action; but, in addition to well marked Conia symptoms, its use as a subcutaneous injection, both in animals and the human subject, gave rise to effects quite foreign to the action of Conia, and not observed in any of my experiments with other Conias, viz.,—decided irritation of the vagus nerve, leading to depression of the heart's action, with consequent pallor and faintness, and vomiting, with great irritability of the stomach. These effects I proved in my own person, and I shall shortly describe them. After being injected with ℥ss of this Conia—neutralised and in solution as before—I set off on a visit to the wards. In ten minutes, effects commenced in the eyes and rapidly intensified in their usual manner; but, in addition, gradual weakness of the circulation and a feeling of faintness came on, so that, in thirty minutes, I was so shaky and trembled so much on my legs, and, therewithal, was so much nauseated and faint, that I had to retire from the wards to my own room. At this time I felt cold and very weak, and it was just as much as ever I could do to refrain from seeking some

<sup>1</sup> ℥ij of it, hypodermically injected in solution as before, failed to kill a rabbit weighing three pounds, and ℥jss caused only slight cicutism in a healthy adult.

assistance on my way; but I managed to drag myself upstairs holding on by the bannisters. On looking at myself in the glass, I saw I was very pale, and I determined to take some stimulant, and, forty minutes after injection, drank some brandy and water, but vomited it almost immediately. The pulse was now very feeble, and, fearing that something serious might occur on account of my not being able to retain any stimulant administered by the mouth, I lay down on the sofa and sent for my colleague—Dr. Major—who kindly came to me at once. He covered my limbs with rugs, and, fifty minutes after injection, I took, from him, fl 3j Sp. Ammon. Aromat. in a little Hollands and water, but the stomach rejected it at once. One hour after injection, I swallowed fl 3j Sp. Ammon. Aromat. in a little water, and was gratified to find that it was retained by the stomach, the irritability of which was now passing rapidly away. One hour and a quarter after injection, I took a glass of Hollands and water, which remained, and, after this, I rapidly improved, feeling quite well again and resuming duty about two hours after injection, and taking, half-an-hour later, a hearty lunch. I got almost as powerful effects on two other healthy adults injected with the same Conia. Subcutaneously used in the lower animals,  $\text{m}\frac{4}{5}$ ths (in solution as before) was a fatal dose for a cat weighing six pounds, and  $\text{mij}$  killed a dog weighing thirty-two pounds in half-an-hour, severe retching and vomiting, besides well marked cicutism, forming part of the symptoms. The superadded effects caused by this specimen of Conia bear a strong resemblance to those which would be caused by Aconitia or Tartar Emetic, and I have therefore repudiated it as being dangerous and impure. I wrote to Messrs. Davy, Yates, and Routledge, requesting an explanation as to the great difference in action which existed between this and the former specimen sent by them to us—the former being pure and of average strength, and one of the seven previous lots used by me in my experiments, and referred to above. The only information they could give me was—that “Conia (like many other similar alkaloïds) is manufactured abroad,” that both the samples they supplied us with were obtained “through the same channel,” but (as they ascertained on enquiry) the last



specimen received was not made by the same manufacturer as the first, and that the manufacturer, of what I consider to be the impure specimen, confessed his entire inability to explain the results I had obtained, adding, at the same time, that "the bulk from which it was taken was manufactured three years ago." In the meantime, some of this Conia has been returned to the manufacturer for careful examination and future report. Time and space forbid my investigating further, at present, the cause of this variability in the action of different specimens of Conia; but I must take this opportunity of strongly advising all those who may hereafter use Conia as I have done, to discard at once, as impure and unsafe, every specimen of it which may be found to affect the heart in any way; for, if there is one thing on which all former investigators into the action of Conia are agreed, it is—that it leaves the heart unaffected. Dr. Christison (*loco cit.*), after stating that the whole phenomena of poisoning by hemlock are identical with those produced by Conia, says that "it was supposed to exhaust the irritability of the heart, but I have endeavoured, on the contrary, to show that it leaves the heart's action unimpaired." M. Verigo (*loco cit.*), as one of his conclusions with regard to the action of Conia, says it "exhibits no action upon the heart or pulse." Kölliker, Guttmann, and J. Harley, all conclude that Conium does not affect the heart. In the very interesting case of poisoning by hemlock, so fully recorded by Prof. Bennett in his "*Principles and Practice of Medicine*" (p. 459), the heart continued to beat for *ten minutes* after respiration had ceased; and, in all my experiments on animals (excepting with this impure Conia), the heart beat vigorously for some time after the cessation of respiratory movements. Guttmann has, moreover, shown that cessation of the heart's action, in an animal poisoned by Conia, can be long retarded by artificial respiration, proving clearly that death commences in the lungs, and that the cessation of the heart's action is merely a secondary effect. All observers are, I think, also equally well agreed that Conia has no influence on the gastro-intestinal tract.

The third and last specimen I shall refer to, as having varied considerably from the others, is that which I have most recently received. It was procured from Messrs. T. & H.

Smith, of Duke Street, Edinburgh, and I have reason to believe it was manufactured with great care, so much so that there was considerable delay in getting it from them on account of the first lot having "gone wrong" and not being warranted good. This Conia was a lot of one fluid ounce: it has a clear and thin syrupy appearance, and is as transparent as water; shaking the bottle causes a slight opalescence in the fluid, which, however, disappears after rest, there being some slight sediment in the bottle no doubt: it has a strong mousy and acrid odour, and all the other reactions of Conia. As to strength and action, it differs from my first seven lots in just being about twice as strong and evidently much purer, and it stands in relation to them as "Christison's" did to "Morson's" Conia, in the experiments of Drs. Crum Brown and Fraser, already referred to. It just takes about an equal part of strong Acetic Acid to neutralise it, and when afterwards dissolved in spirit and water, according to my formula, the solution ( $\text{m}_j$  of Conia in  $\text{m}_v$  of solution) is at first quite clear and colourless, but assumes a slight amber tint by keeping. I find that  $\text{m}_{ss}$  of this Conia will, when injected subcutaneously as before, kill a rabbit of two pounds nine ounces in weight, in thirty minutes, and that  $\text{m}_j$  suffices to kill a dog, about ten pounds weight, in thirty-four minutes. The dog had an overloaded stomach and vomited several times, in addition to the other symptoms; but nothing of the kind occurred in the case of the rabbit. Another rabbit, weighing two pounds thirteen ounces, recovered after a dose of  $\text{m}_{\frac{2}{3}}$ ths of it had been administered in a similar way; no vomiting. Subcutaneously injected (in accordance with my formula) in myself and other healthy adults, it gives twice as strong Conia symptoms as any of the seven former specimens did, whilst, at the same time, no dangerous symptoms, not truly cicutic, are superadded. This is the Conia I am now using, and shall continue to use for the future; and I can recommend it strongly to anyone who might wish to try the use of Conia, as being thoroughly trustworthy and reliable. I have perfect confidence in Messrs. T. & H. Smith, that they will be able to continue to supply further specimens of equally good quality. On writing to them to know if it was of their own manufacture, they tell me that they "have not hitherto engaged



in its manufacture, the demand for it in this country being so very limited;" and, without informing me who the manufacturer is, they add, that "with principles of so powerful a nature as Conia" they are "most careful in drawing" their "supplies from reliable sources." I have quite recently further ascertained from them that this specimen of Conia "was prepared from the *Seeds*." I can quite understand their reticence in this matter, and, really, so long as I can procure good and pure Conia, it is immaterial to me whether I am acquainted or not with the manufacturer. I am now giving this Conia in solution as before, in doses of  $\text{mj}$  twice or thrice a day, either alone or combined with Acetate of Morphia.

This variability in the strength of Conia renders it necessary that new specimens of it should, at first, be very cautiously used, until it is ascertained of what strength they are, and if they contain any impurity; but in the case of an excited patient one might, I think, safely commence with doses of *one-fifth of a minim of any Conia*; at any rate I should have no hesitation in commencing with this dose on myself. The dose should be gradually increased until decided physiological effects are experienced or observed. Specimens of Conia procured from *one* source will, of course, be less liable to vary than those got from *different* sources; and I have full hope that, in process of time, the manufacturer, with whom I am now dealing, will not only be able to continue to supply Conia of good and stable strength, but to put us in possession of a stable crystallisable salt of Conia, soluble in water to a sufficient extent for the purposes of subcutaneous injection. The stimulation of a further and larger demand is all that is required to lead to this result. In treatment of cases of mania by Conium—whether Conia itself or the Succus Conii—its use is in all cases rendered more satisfactory and free from fallacy by careful previous experimentation with it on animals, oneself, and other healthy adults.

#### TREATMENT IN CASES OF POISONING BY CONIA.

It might be well if, from my experience of the drug, I should briefly state what I should consider the most appropriate treatment in a case of poisoning by Conia.

Dr. Harley has shown that the influence of Conium is in proportion to the *motor activity* of the individual; and, as I have had occasion to say before, I have proved this on myself; for I found that the effects (after a subcutaneous injection of Conia) always disappeared more rapidly if I kept in motion, and that they were more prolonged if I remained in a condition of rest. Hence, were an overdose given, or idiosyncrasy to interfere, it follows that forced exercise would be of great assistance in working off the action of the drug. Should such exercise be out of the question, then stimulants administered to the patient by the mouth and rectum, might enable him to make successful effort to move about, and they would, at any rate, quicken the circulation and thus hasten elimination. The flagging respiratory movements might be stimulated by means of sinapisms to the sides of the chest and pit of the stomach, and the use of the electric current. In the event of failure of respiration, then artificial respiration should, in addition, be resorted to, and steadily persevered in, so long as the heart continued to beat. The patient should be kept warm by means of blankets and hot bottles, and, from time to time, strong Ammonia might be applied to the nostrils to stimulate and excite respiration. We might further do some good by drawing off the urine; for, though Dr. Harley denies that Conia, as such, can be detected in either the breath, sweat, fœces, or urine; yet the experiments of Zalewski,<sup>1</sup> (who got Couia from organic mixtures by shaking them with *petroleum ether*) show that the poison speedily appears in the urine, and is constantly present in that secretion during the course of the toxic symptoms; and that, indeed, the alkaloid is excreted nearly entirely through the kidneys, being detected in the urine of a dog two and a half days after the administration of the poison.

I think I have indicated the only rational means to be adopted in the case of an overdose of, or poisoning by, Conia in its pure condition, the mode of death being by apnœa. Should dangerous symptoms arise from impurity, then treatment should be according to the symptoms.

1 'Virchows and Hirsch's Jahreshesher,' 1869, i, p. 365.

## COMPARISON BETWEEN CONIA AND SUCCUS CONII.

Dr. Harley estimates that fl 3 ij of the Succus Conii are equivalent to about m j of Conia, *i.e.*, from that amount of Succus he can prepare that quantity of Conia. Comparing the effects of Messrs. Davy, Yates, and Routledge's "double strong" Succus (which is the strongest we have yet used) with the best Conia I have yet procured (Messrs. T. & H. Smith's), I find that m  $\frac{2}{3}$ ths of Conia, subcutaneously injected as before, is equal in action to about fl 3 j of the Succus given by the mouth, the only difference being, that, when Conia is used subcutaneously, the effects both come on and disappear more rapidly. Comparing the Succus with my seven former specimens of Conia, I find that m j of the Conia is just about equal in action to fl 3 j of the Succus. These facts I have ascertained by experiments on myself and other healthy adults. Two fluid ounces of the strong Succus, administered by the mouth, through a No. 12 Catheter passed down the œsophagus, killed a cat weighing six pounds ten ounces, which I last saw alive seven hours after the Succus had been given, but found dead eleven hours later, though *rigor mortis* (which came on subsequently) had not yet supervened. One and a half fluid ounce of the same Succus, given similarly, to a cat weighing ten pounds, failed to kill it, though causing very powerful and prolonged hemlock symptoms. Neither of these cats vomited.

The *Succus Conii* is about 2d. per fluid ounce, and the *Conia* about  $\frac{1}{2}$ d. per minim; thus, though subcutaneous injection would be very inconvenient and even impracticable for general use; yet the same effects would be procured for from a  $\frac{1}{4}$ d. to  $\frac{1}{2}$ d. by the subcutaneous injection of Conia, to produce which, with the best *Succus* administered internally, it would require the expenditure of 2d.

## COMBINATION OF CONIA AND MORPHIA IN SUBCUTANEOUS INJECTION.

Morphia acting upon the sensori-motor and ideo-motor centres, and Conia upon the purely motor centres, it would seem to follow, as a fair corollary, that their use, in combination, would lead to effects, distinctly antagonistic in their character to the

condition of maniacal excitement. I hope, therefore, to find an antidote for acute mania in the combined use of these alkaloids by subcutaneous injection. I find that a solution of Acetate of Morphia, of the strength of grain  $\frac{1}{4}$  to  $\mathfrak{m}\mathfrak{v}$ , mixes readily with the solution of the Acetate of Conia which I use. A solution of Morphia, of this strength, deposits a sediment on cooling of the water in which it is dissolved; but, when it is shaken well, and an equal part of it and my solution of the Acetate of Conia are mixed together, the resulting solution becomes quite clear and is of the very convenient strength of  $\mathfrak{m}\mathfrak{ss}$  Acetate of Conia, and grain  $\frac{1}{8}$ th Acetate of Morphia in  $\mathfrak{m}\mathfrak{v}$  of the solution. By subcutaneous injection, in the lower animals, I have killed an unhealthy rabbit, weighing *three pounds nine ounces*, in nineteen minutes, with  $\mathfrak{m}\mathfrak{v}$  of this combined solution; whilst, in the case of another rabbit weighing only *two pounds thirteen ounces*, but being strong and healthy,<sup>1</sup>  $\mathfrak{m}\mathfrak{i}\mathfrak{j}\mathfrak{ss}$  and  $\mathfrak{m}\mathfrak{v}$  of the same solution, similarly administered, on two separate occasions, did not cause death, although, in the former instance, the symptoms were considerable, and, in the latter, exceedingly well marked. There was no change in the pupils of either rabbit during the whole time of operation of the drug, remaining, as they did, three quarters dilated. The nature and progress of the symptoms were much the same as those produced by Conia alone; but there was a superadded condition of drowsiness, and, in the rabbit which recovered, very decided prolongation of the effects; for instance, the rabbit which was injected with  $\mathfrak{m}\mathfrak{v}$  of the combined solution, lay for *three* hours on the floor in a drowsy and semi-paralysed condition, whereas (see p. 11) a rabbit of the same weight, injected with a dose of  $\mathfrak{m}\mathfrak{j}$  of Conia, in solution as before, and uncombined, was quite well and lively *two* hours after the injection, though at one time it was almost completely paralysed.

I am now using this combined solution of Conia and Morphia, largely, as a subcutaneous injection in cases of Mania, with very good results, which, I trust to have a further opportunity of recording; and, at the same time, of discussing the

<sup>1</sup> I have frequently observed that, if rabbits have swollen bellies, dry scurfy skin, or be otherwise unhealthy, drugs act much more rapidly and strongly on them, than healthy rabbits.

antagonistic effects of Conia and Strychnia when subcutaneously injected, as well as the use of the former in tetanus, hydrophobia, and other spasmodic affections, concerning which I am at present engaged in making experiments and investigation.

## CONCLUSIONS.

Though necessarily recapitulating to some extent, I think the foregoing observations will warrant my coming to the following conclusions with regard to the action of Conia and its uses:—

1st.—Conia is too powerful and too irritant to be administered internally alone; but, when neutralised with acid and in bland solution, there is no reason why it should not be used internally, in suitable doses, and thus produce well-marked cicutism without any topical irritation.

2nd.—Pure Conia may be injected under the skin, in large quantities, without leading to any result except the formation of an abscess, or the production of considerable local irritation at the site of injection.

3rd.—Conia, neutralised with Acetic or Hydrochloric Acid, and dissolved in spirit and water, acts very rapidly and powerfully, when subcutaneously injected, in pigeons, frogs, guinea-pigs, rabbits, dogs, and cats; and, when thus used in doses of from  $\text{mss}$  to  $\text{mij}$ , in the healthy human subject, it produces well marked cicutism.

4th.—Thus administered, it may be used therapeutically, in doses of from  $\text{mss}$  to  $\text{mij}$ , in cases of *mania*, with the result of subduing motor excitement, warding off emaciation and exhaustion, and promoting recovery. The strongest Conia may be thus administered, commencing with doses of  $\text{m}_{\frac{1}{10}}$ th and gradually increasing, in proportion to the motor activity of the patient, until decided physiological effects are produced.

5th.—When thus administered, the use of Conia does not lead to any disturbance of the digestive function, interference with the circulation, or any considerable local irritation.

6th.—The most suitable cases for treatment by the hypodermic injection of Conia, neutralised and in solution, are those of *acute mania*, where the brain lesion is not *organic*, and



where medicine, if given by the mouth, would require to be administered with the stomach pump.

7th.—Conia acting upon the purely motor centres, in a sedative manner, and Morphia acting in a similar way, on the sensori-motor and ideo-motor centres, it follows, as a fair corollary, that the combination of the two, in subcutaneous injection, should lead to effects directly antagonistic to the condition of maniacal excitement; and such being, in fact, the case, they may be thus used together, with very great success in the treatment of cases of mania.

8th.—Conia might be very useful, as a subcutaneous injection, in cases of poisoning by Strychnia, as well as in tetanus, hydrophobia, and other spasmodic diseases.

9th.—Specimens of Conia, as obtained from *different* sources, vary very considerably in appearance and strength, and they may be rendered dangerous or unfit for use, in the human subject, on account of impurity. Too much caution can not, therefore, be observed in the first use of a new specimen, until its strength is ascertained.

10th.—Conia, as obtained from chemists in England and Scotland, is manufactured, for the most part, abroad. The best and purest Conia is prepared from the *seeds* of the *uncultivated* plant, and, in order to avoid variability, all supplies of it should be drawn from some *one* good manufacturer, with directions that it should be so prepared.

11th.—An increased demand for Conia is all the stimulus that is required to lead to the production of a crystallisable salt of it, of stable and uniform strength, and sufficiently soluble in water for the purposes of subcutaneous injection.

12th.—mss of the best Conia (costing  $\frac{1}{4}$ d.) subcutaneously injected, neutralised and in solution, is equivalent in action to about fl 3j of the best Succus Conii (costing 2d.), administered by the mouth.

#### HINTS AS TO SUBCUTANEOUS INJECTIONS, GENERALLY.

There are so very many little points (only to be learnt by lengthy experience), that it is necessary to attend to, if one wishes to use subcutaneous injections safely and successfully; that I may, perhaps, be excused for calling special attention to a few of the most important of them, for the benefit of those (who now-a-days must be few, however,) who may not have had much



experience of the administration of drugs in this manner. Firstly, then, as to the *solution* :—it should be as bland and non-irritating as possible. Secondly, as to the *syringe* :—the piston should be well packed and should work easily without regurgitation behind it when it is in action : the perforating needles should be made of *steel* and should fit closely on to the nozzle of the syringe : gold or platinum needles require to be pretty coarse to give them strength, and, even then, they are not sharp and firm enough to admit of the easy, and almost painless, perforation caused by the steel needle : a little careful attention and frequent use of the silver-wire stilette will prevent rusting or blocking up of the canal in the needle : it is better that the minims should be marked on the glass than on the rod of the piston, and it is very important that the minims of the syringe should correspond with the minims of the measure with which the solution is prepared : in a syringe I have recently obtained, the measure is by *millimetres* marked on the rod of the piston, and I find that *one minim* is equal to *two millimetres* : complications of screws and moveable blocks on the piston-rods are really unnecessary and inconvenient, the simpler the arrangements are the better : besides a syringe and two needles, there ought to be in each injection case a bundle of fine wires for stillettes, and a small bottle capable of holding from one to two fluid-drachms of a solution : the neck of the bottle should admit of the passage of the thickest part of the lower extremity of the syringe, and a *finely* ground stopper should fit into it. Lastly, as to the *method and site of injection* :—a fold of skin should be nipped up between the thumb and forefinger of one hand, whilst, with the other, the needle should be thrust *perpendicularly* (there is thus no danger of injecting a vein) through the skin into the cellular tissue. The injection should be made slowly, and, after the needle is removed, a finger should be applied over the point of injection, and gentle pressure or friction exerted over the small tumour caused by the fluid, until it is diffused throughout the neighbouring cellular tissue. I generally inject between the shoulder blades, when the patient is in bed, and in alternate arms, when he is up and about.

ON THE  
MINUTE STRUCTURE  
OF THE  
CORTICAL SUBSTANCE OF THE BRAIN,  
IN A CASE OF CHRONIC BRAIN WASTING.

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It is scarcely necessary to say, with reference to the subject which I propose briefly to consider, that it is one which presents many difficulties. I consider that the histology of the brain, whether in its healthy or in a morbid condition, in addition to those difficulties which beset the minute examination of all the tissues, presents some which may be said to be peculiar to itself. It may be well to pause a little over this point, as it is one, the importance of which cannot, I think, be over estimated. Almost every organ and tissue of the body has, either in part or as a whole, some definite structural arrangement, which in health does not vary. Thus, taking the lung as an example, we know that under normal circumstances, a section taken from one part will agree, in all essential points with one from another part; and if we find this not to be the case, we do not hesitate to say that the specimen before us is in an abnormal state. With the brain it is far otherwise, and he who so reasoning, would here proceed to pronounce on what is normal and abnormal in structure, would fall into the error which I now seek to expose, in order fully to guard against it. I think that amongst those who have not studied the subject for themselves, a certain misconception is apt to arise on this subject. The minute structure of the cortical substance of the brain has been the subject

of investigations by Dr. Lockhart Clarke, the importance and value of which we all recognise. He has given us what he considers to be the usual arrangement of the structural elements in the various parts. After his description however, the following observation occurs:—"But not only in different convolutions does the structure assume, to a greater or less extent, a variety of modifications, but even different parts of the same convolution may vary with regard either to the arrangement or the relative sizes of their cells." This is a statement which requires but little experience to confirm most fully: but it is one, I think, the truth of which is not always borne in mind; and hence the misconception I have alluded to of supposing that in a given convolution or lobe a certain structure will be found, and on the other hand, that if such is not the case there is something unusual present. The importance of being thoroughly acquainted with the real facts; of knowing that deviations may occur from the structural arrangement usually found, and still without morbid change; of being able to estimate to what extent such variations may be present, consistently with healthy organization; and of knowing the situations in which these are most likely to occur—the importance, I say, of these points must never be lost sight of, for it is these which give to the subject those peculiar difficulties to which I formerly referred. If it be true that, as regards the grey matter of the brain, we cannot be certain at any given spot either as to size of the cells or their arrangement; how, it may be asked, can we be prepared to say whether any specimen placed before us is normal or the reverse? Only, I conceive, by a full knowledge of those varying appearances which may be encountered in a state of health, so as to be able to weigh their relative importance and constancy; and then by comparison of the diseased with the healthy brain, by means of an examination conducted side by side, in order to contrast the general appearances presented by the one, as brought out by numerous sections, with those exhibited by the other under similar conditions. This method I have, to a certain extent, carried out. The brain which I selected as the standard, by which to judge of the condition of the other, was one, the healthiness of which could not admit of doubt. It was that of a railway porter, a young man in full health, who

was accidentally crushed while at work, and died from shock, having sustained rupture of both Liver and Spleen. It presented in every respect the appearances of a perfectly healthy organ. The brain which I have examined and contrasted with the former, was that of a man who, in life, presented a typical case of Chronic Brain Wasting, as described by Dr. J. Crichton Browne.<sup>1</sup> The case terminated fatally about six months after admission into the Asylum. Towards its close both mental and physical symptoms developed themselves rapidly, and ushered in the fatal termination, the immediate cause of which was serous apoplexy. With regard to the post-mortem appearances, it is only necessary for me to say that they contrasted strongly with those usually met with in General Paralysis; more especially with respect to the Pia-mater, which at no part was adherent to the subjacent cerebral substance. There was no thickening or opacity of the Arachnoid. I may add, that the whole brain weighed only 41 oz., that a large quantity of serum escaped during its removal, and that the Frontal and Parietal lobes of both hemispheres presented a somewhat compressed appearance. I have examined microscopically these two brains, to the extent of the Frontal, Parietal, and Occipital lobes in each, by means of numerous sections. The method of preparation I have followed throughout, is that known as the Lockhart Clarke method, and to the excellence of its principle, I may, perhaps, be permitted to add my testimony. It is not my intention to enter into a detailed description of the structure and appearances presented by the healthy brain under the microscope, further than to consider those points in its structure with regard to which the diseased organ seems to present a different condition.

1. *Frontal lobes.*—On contrasting two sections, both taken from the grey matter of the Frontal lobe, but one representing the healthy, the other the diseased brain under consideration, under a low magnifying power, it is at once seen that a somewhat different appearance is presented in each case. Remembering however the fact, that there may be difference without abnormality, other sections are compared, but the result is

<sup>1</sup> Lectures on 'Brain Wasting,' by Dr. J. Crichton Browne, 'British Medical Journal' for April 29th and May 6th, 1871.

still the same :—there is, clearly a difference. This is a point of great importance, and one which I desire to establish before proceeding further. Without at present entering into the causes of this difference, I may say that in all my sections, to a greater or less degree, it is to be observed. There is, speaking generally, a delicacy and distinctness of structure observable in the healthy brain, as seen with a low magnifying power, which is wanting in the other ; and this be it remembered, with both viewed under exactly similar conditions. Whether the exact nature of the change be demonstrated or not, does not alter the fact ; and for my own part, I do not understand how some who have brought both ability and care to bear on the subject, have been forced to admit themselves beaten at all points. On referring to a well known work on Psychology I find the following observation.<sup>1</sup> “It seems reasonable to expect that by the aid of the microscope, one would be able to ascertain whether any exudation or addition to the inter cellular substance of the brain, or any change in size, shape, or proportionate number of its cells, takes place ; and in the indurated brain of chronic insanity whether that finely fibrillated exudate which has been described by some writers, actually exists ; also, whether in extreme atrophy of the brain, any part of it exists in the diminution of the size or proportionate number of the cells or tubes. In none of these points of inquiry, have we been able to obtain the slightest success.” Such a statement coming from such high authority is certainly not very encouraging, but on the other hand, we have the cheering fact that changes in the nerve cells *have* been seen and described ; and if this be the case, there seems no reason why further success should be out of reach. With respect to my own observations, and the change formerly referred to as existing in the morbid brain at present under consideration, I cannot doubt that such a change does exist, and my decision has been strengthened, not only by the testimony of others well qualified to give an opinion, but also by a circumstance which occurred to myself, and which I shall venture to narrate, as furnishing I think, conclusive evidence on this point. I was engaged in looking over a number of sections of

<sup>1</sup> ‘Psychological Medicine,’ by Drs. Bueknill and Tuke, second edition, p. 484.



healthy brain, which I had recently made from the same convolution, when my attention was suddenly arrested by one which presented a marked difference in appearance from the others. I was at first considerably disconcerted, thinking I had found a greater variation in health than I had before seen, or thought possible; but my satisfaction was great on finding that I had to do with a section of the morbid brain which had accidentally got mixed up with the others.

I shall now endeavour more in detail, to describe such points of difference as I believe I have been able to make out, by careful examination, and comparison under higher powers.

The delicate layer of fibrous tissue which extends over the external surface of the convolutions and which under normal circumstances is extremely thin, presents, in this part of the diseased brain, a thicker and coarser appearance than I have been able to find in a state of health. I do not think, however, that much importance should be attached to this observation, for this layer is liable in the healthy brain to vary considerably in different parts; but I note the fact as one for further inquiry.

The layer of nerve substance immediately internal to this, forms the outer layer of the grey matter. As seen in the healthy organ, it is pale in colour, having a very homogeneous appearance, and, especially in its more superficial parts presents only a few small vessels, and what I believe to be corpuscles of the neuroglia. These bodies in this situation, average in size, a little over half that of a red blood corpuscle. They are circular or slightly oval in form, but slightly stained by carmine, and contain a small number of molecules. Proceeding a little deeper we find that these bodies become more numerous, and together with small nerve cells and nuclei, constitute usually a very distinct layer having a darker appearance than that on either side. Passing now to examine the morbid brain, with reference to these points, it is found that the outer layer of grey matter does not present the characters above described as being present in health. In almost every instance, I have found it in this region, the seat of change more or less marked. Instead of being delicate and homogeneous with few corpuscles of any kind, it presents these bodies in large number, and in some instances, especially in the outer part where it meets the superficial white fibrous tissue, has a coarse and



slightly fibrillated appearance. With regard to the layer which succeeds this, and which I also referred to, we find that it is not in any way less distinct; on the contrary, it is if anything better marked, owing apparently to an increase in some of the elements which go to form it. It is made up of nerve cells, invariably of small size, and having in most cases a round or oval form. With these there are other corpuscles differing somewhat in appearance from the former, and the structure and nature of which will shortly be discussed; and lastly, we find abundant neuroglia corpuscles. It is, I believe, chiefly by an increase in the number of the last mentioned bodies, that the layer under consideration is more distinct than in the healthy organ; for in both cases all the elements above mentioned are found, and in no case have I been able to detect any difference in their minute structure.

We now come to the deeper layers of the grey matter, and in a state of health we there find the appearances which are so characteristic. Large nerve cells chiefly angular or fusi-form in shape, containing nuclei and nucleoli, and sending out branches in all directions from their numerous poles. These cells are sharply defined, and show out very distinctly in the clear delicate matrix in which they lie. In addition to these we find small nerve cells, nuclei and connective tissue corpuscles. There is however no confusion in the arrangement of these elements; on the contrary, a distinct and definite arrangement is always to be noticed. But if we now examine corresponding sections of the diseased brain, in order to ascertain its condition on these points, a difference is at once noticed. The large nerve cells seem to be comparatively few in number, and in no case in this situation, have I been able to see them forming distinct rows such as are constantly found in the healthy organ. They seem to be scattered in an irregular manner throughout the deeper layers and without any apparent order. This fact, coupled with the circumstance that they seem to be deficient in number, to my mind affords pretty conclusive evidence that some have disappeared. A little consideration suffices to show the great probability, I think I might even say the certainty of this point; for if it be true, as it most certainly is, that under normal circumstances the large cells are arranged

together in rows or layers, then a deviation from this condition must imply a loss in the number of these cells. Just as would be the case with a company of soldiers under a destructive fire, did not the survivors close up and fill the gaps made by those who had fallen. Nerve cells, however, are incapable of thus manœuvring, and hence disorder in the ranks is the consequence.

I have thus considered the large nerve cells as regards arrangement and number; but careful examination and comparison has satisfied me that other points of difference exist. I believe that there will be found in many instances, a distinct deformity of the cells, and one which, when compared with the regular and well formed appearance of those in a state of health, can scarcely fail to attract attention. The most common, as well as the most distinct change, which I think I have recognised is one which is somewhat difficult to describe. If the nucleus were absent, the cell would present a simple pyriform appearance, with one branch proceeding from the pointed extremity. But in the interior of the cell and situated towards its narrow pointed extremity, is the nucleus, closely applied and apparently somewhat flattened against the cell wall. This gives to the cell a peculiar appearance and one which I think is best described by the term "hooded." Varying slightly but distinctly from these are others, in which one of the angles has lost its sharp prominent appearance, being rounded off and apparently not giving origin to any fibre, the other poles however, retaining their usual character. Others again are to be seen having a bent condition, the base of the cell being twisted round so as to point at right angles to its proper axis. Further, numerous smaller cells are found having a constricted or shrunken appearance of the wall; the cavity being almost entirely occupied by the nucleus which is disproportionately large, and sometimes even forms a distinct projection. Lastly numerous bodies are seen, usually oval in form, somewhat deeply stained by carmine, and with distinct granular contents; in some cases also presenting a minute nucleolus like body in their interior. They present in short all the characters usually seen in the nuclei of the large cells. Their true nature is, I believe, still a matter of dispute. By some they are described as nucleus like vesicles, and by others as simple nuclei. As to

which is the correct view, I shall not at present venture an opinion; but it is, I believe, these bodies which Dr. Tigges considers to be nuclei which have escaped from the interior of the cells, and there would certainly seem to be grounds for such a conclusion. I must not forget to mention that the condition described, I think by Dr. Sankey, as a torn state of the continuations of the cells is often to be noticed: there is of course some difficulty in being quite certain on this point, but of its frequent occurrence I have myself no doubt, and to this we must attribute the difficulty with which the fibres are to be traced in the diseased as compared with the healthy brain. With regard to the contents of the cells and their nuclei, I have failed to detect anything abnormal. But although I have described a change in the form of some of the cells as being present in the morbid brain under consideration, it would be wrong to suppose that such changes are noticed in all. In many instances I have not been able to detect anything abnormal, and, on the other hand, in the healthy brain occasional peculiarities in the conformation of the cells may be noticed. It could indeed be scarcely supposed, that in an organ constantly undergoing change, the case could be otherwise. The difference I believe lies in this. In the one such changes are exceptional; in the other they are the rule. There is one more condition which I have found very commonly, and that is a want of that firmness of outline which is so prominent a feature of the cells in health. Change in this respect was observed and described by Dr. Lockhart Clarke, more than five years ago, as existing in General Paralysis.<sup>1</sup> He also described a distended condition of the cells by pigment granules; the latter condition, however, I have not been able to find in Brain Wasting. As regards the other cell elements I have not been able to make out any change in their structure, but I certainly think they are increased in number; and indeed, if my observation as to the number of the large cells be correct, this conclusion almost of necessity follows; for there can I think be no doubt that as a whole the number of cells of every description is not inferior to that in health. The result of my own observation as to the relative number of these smaller bodies in each case, though

<sup>1</sup> 'Lancet,' Sept. 1st, 1866.

I cannot pretend to certainty, is in favour of this idea. Thus, in the middle layers of the grey matter where the large cells are arranged in rows, they are seen under normal circumstances to be separated by little, except the delicate neuroglia in which they are all imbedded; only a few smaller bodies being scattered here and there between them. But this is not the case in the morbid brain under examination, for in this region the whole thickness of its cortical substance is seen on section to abound with small cells and nuclei; and this, I believe, is one of the chief causes of that difference in the general appearances presented by different sections, and to which I formerly drew attention as being the first to attract notice.

2. *Parietal lobes.*—An examination of these lobes in both cases, does little, I think, but confirm the observations previously made, with respect at least to the most important points. I have not, however, been able to notice in this situation the thickening of the superficial layer of fibrous tissue, which I was led to think exists in the frontal region; neither have I observed such an increase in the number of connective tissue corpuscles of the outer layer, as formerly described. In both these respects the appearances closely resemble those found in health. But with regard to the deeper layers the change is very marked—more so, I think, than in the frontal region, though of a similar nature. At first sight, indeed, under a low power, one would be inclined to pronounce all the cells to be of equal size, and arranged without any order. Further observation however, soon shows that this is not the case, and reveals differences in the cells, though these differences as I have endeavoured to show, are considerably modified by morbid processes.

3. *Occipital lobes.*—As regards these lobes, I shall, in their examination, follow the course I before adopted, and proceed to consider first, the general structural arrangement, as seen with a power of about 200 diameters. In all my sections of the grey matter in this part of the healthy brain, I have found the arrangement of the cell elements to be singularly constant. The large nerve cells form two distinct layers, one of which lies superficial, the other on the deep aspect of another well marked intermediate layer, formed almost entirely of small round or

oval nerve cells and nuclei. The latter is situate about midway in the depth of the cortical substance. Of the large cells above referred to, those forming the most superficial band are of considerable size, in some cases indeed, very large, and though not as a rule numerous, still form a distinct layer in this situation. The corresponding cells on the deep aspect of the intermediate layer, I have not found, as a rule, to be so large as the others; they are however considerably more numerous, and form a broad band of cells which passes gradually into those beneath it as the elements of which it is composed, become fewer and the nuclei more abundant. I believe it will be found that the large cells also differ somewhat in shape in different situations; those most superficial being, as a rule, very distinctly angular, while those situated deeper are commonly oval or pyriform. I should state that the above description must not be understood as applying to the *extremity* of the posterior lobe. In the latter situation the cells, as described by Dr. Lockhart Clarke, are all small, with the exception of a few in the inner layer which are somewhat larger. The difference in arrangement formerly referred to as liable to occur in the same lobe is here well illustrated.

Passing now to examine corresponding sections of the morbid brain, we at once notice that a somewhat different state of things is present. True, the same general arrangement is evidently to be found, but it is somewhat modified. The layer of small nerve cells before described as lying about midway in the depth of the grey matter is distinctly present, having apparently undergone little or no change; but it requires, in some instances, close observation to recognise a distinct arrangement of those larger cells which we have seen, under normal circumstances, bound it on either side. They do not at once attract attention as they should do. That cells do exist, having a larger size than others, is indeed undoubted; but they are comparatively indistinct, few in number, and hence do not present the well defined layers as seen in the healthy organ. I have not, however, been able to notice, or only to a very slight extent that condition of the large nerve cells, which I described as existing in the other regions, and which I called 'deformed;' but, on the other hand, I believe that the branches given off by the



cells are in this, as in other situations, very deficient and present in almost every specimen I have examined, a marked contrast to those in health. With regard to the other cell elements found in this lobe, viz., the small nerve cells, nuclei and connective tissue corpuscles, I think that the last are in this, as in other parts, increased in number; but with respect to the small nerve cells, I have not been able to satisfy myself as to any change either in their number or appearance. I have however noticed, and more especially in this lobe, numerous pale coloured bodies, about the size of a red blood corpuscle, having a distinctly granular appearance. They are seen pretty numerously, and, so far as I have been able to determine, are not confined to any particular part of the grey matter. They seem to me quite distinct from either connective tissue corpuscles or nuclei. Whether these are the exudation corpuscle of some writers, I cannot say. I have, however, observed them quite distinctly in my sections of healthy brain, and do not therefore attach to their presence any pathological significance.

Two more points remain to be considered, viz., the blood vessels and the delicate substance which supports the cell elements, and called by Virchow the "neuroglia." With regard to the vessels, an examination of the morbid brain under consideration, can, I think, leave no doubt that they are affected, and that to a considerable degree. The most noticeable changes are, I think, increase in the size and in the thickness of the walls of the small arteries. They present altogether a coarser appearance than is met with in health, and in all cases I believe their nuclei to be greatly increased in number. As regards those conditions which have been described by Rokitansky and also by Drs. Lockhart Clarke, Wedl, Sankey, and others, as being present in cases of General Paralysis, viz., tortuosity of the vessels with varicosities or knots at different points, I have been able to see in many instances slight waviness and tortuosity, but not to such an extent as to produce a "kink," as described by the last-named author; neither have I observed any distinct knots, though a dilated and varicose condition is commonly enough met with. As to the sheath described by Rokitansky, Wedl, and others, which surrounds the small arteries in General Paralysis, and in other forms of cerebral disorder, I have been



able to demonstrate it most satisfactorily in the diseased brain under consideration. Though considered by those who first described it as invariably a morbid product, it would appear that such is not the case, and that a similar structure is to be found as a normal condition. To what extent this is the case I am not able to form a decided opinion; but I may say that, in my experience, it is far more conspicuous in disease than in health. In the present case, as I have before observed, it is very well marked, and hence I think that the want of delicacy in this sheath, as ascertained by Dr. Clarke to exist in General Paralysis, applies, in this case at least, to Chronic Brain Wasting.

Lastly, as regards the Neuroglia, I have not been able to satisfy myself of any increase in its density, or metamorphosis of its substance. It might be thought that the greater delicacy and transparency which it presents in the healthy brain, as compared with the other, might be due to actual change in its constitution; but such change is, I believe, in this case, more apparent than real, and results from the increase in the number of the smaller corpuscles as previously pointed out; for, on comparing some sections, parts of which in both cases happened to be comparatively free from cells of any description, I could not make out any difference in either case. That it may be increased in amount is quite possible, and even probable, but I do not think there is structural change;—change such as has been described as so constantly occurring in General Paralysis.

Such then are the appearances I have observed and the conditions I believe to exist; and, in concluding, I have only to repeat that my observations must be considered as applying to *one* case of Chronic Brain Wasting. To what extent they may hold good in other cases of a similar nature, and to what extent they may differ, forms a subject of inquiry which I hope at some future time to be able to consider.

# MENSTRUAL IRREGULARITIES

AND

## INSANITY.

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Some words in themselves convey to our minds a myriad of ideas. What is not expressed by the single word "puberty?" That is an epoch which may justly be called one of the turning points on the road of life. It corresponds with the age of metamorphosis of the stripling boy into the vigorous man, of the delicate girl into the blooming woman, the age at which the eyes are opened, as it were, to a new life, to the discovery of the truth that the sexes are made for one another, the age of the dawn of mutual admiration and attraction.

The physical indications of puberty in the female are so universally known as to need but a short description. The stature has by this time commonly reached its maximum, alterations of voice accompanied with development of hair take place, and the neck, limbs, and figure, generally assume that rounded contour and symmetry which in after-life prove so attractive to the opposite sex. The appetite is capricious, the bowels are irregular, the sleep is disturbed and unrefreshing, there are pains in the back and head, and fulness and weight in the abdomen, accompanied not unfrequently with heat and a troublesome irritation about the lower parts of the person. The general condition of plethora at this period is much relieved by the advent of menstruation, which in most cases occurs in a

healthy manner at regular periods. It is not always, however, that this desirable end is so opportunely accomplished.<sup>1</sup> Irregularities of all kinds in the menstrual function may supervene, and these may be associated with almost any sort of bodily disorder, or may precede, accompany, or follow those diseases in which the intellectual faculties are more or less involved. "La femme est une malade," says Michelet, in reference to this subject, and there can be no doubt that even the most strong minded female is somewhat thrown off her equilibrium at the occurrence of the menstrual crisis. It is a common observation that women are irritable and capricious at that period, any cause of vexation then affecting them much more seriously than at other times, and this statement is fully supported by other authorities.

But we are not to regard the advent of the catamenia as a matter of mere temporary inconvenience to a woman, and as an epoch which only threatens disturbance to her bodily and mental well-being, but as one which is not without its dangers even to life itself.

It has been satisfactorily shown that whilst in childhood the mortality of the male sex has predominated, the female mortality at once rises between 14 and 18 years of age to 1.28 against 1 male death, sinking again in the succeeding four years to the proportion of 1.05 to 1 male death<sup>2</sup> This fact alone is sufficient to justify our endeavours to diagnose the mere alterations in character which occur at healthy puberty from the morbid conditions of body and mind which may be observed in those cases where the catamenial function is not properly performed. And these changes in mental disposition are of a very insidious nature, sometimes occurring so gradually as not to attract attention until they have taken such hold upon the constitution as to be got rid of only with great difficulty, if they can be expelled at all.

"There is no break," says Dr. Tilt, "between the first slight estrangement of a girl's temper and mania; between the slight forgetfulness of pseudo-narcotism and dementia; between those

<sup>1</sup> 'Condensed from Whitehead's *Abortion and Sterility*,' p. 3.

<sup>2</sup> 'Sur la reproduction et la mortalité de l'homme,' M. M. Quetelet and Smits, Bruxelles, 1832. Quoted in Dr. West's 'Diseases of Women.'

first indications of uncontrollable muscular movement, called the fidgets,' and hysterical apoplexy."<sup>1</sup>

As might have been expected the nervous system is frequently affected at this period, and in addition to hysteria, chorea, cephalalgia, neuralgia, and epilepsy, resulting from some irregularity of the menstrual function, we find that insanity is due to the same cause in a great number of instances. Esquirol has said that the derangements of menstruation form one-sixth of the physical causes of insanity, and Morel estimates the number of cases following some irregularity of that function at exactly the same proportion.

The following general conclusions have been arrived at after careful enquiry into the condition of the menstrual function in upwards of five hundred inmates of the West Riding Asylum.

1.—That in idiocy and cretinism puberty is usually delayed or absent.

2.—That in epileptic insanity the fits are generally increased in number, and that the patients frequently become excited at the catamenial period.

3.—That in mania exacerbations of excitement usually occur at the menstrual period, and that a state of intense excitement is almost continuous in patients suffering from menorrhagia.

4.—That in melancholia a large proportion of patients suffer from amenorrhœa.

5.—That in dementia the patients usually menstruate in a normal healthy manner.

6.—That in general paralysis the change of life frequently occurs early.

7.—That very rarely the catamenia reappear in aged insane women after a prolonged cessation.

Some of the above conclusions have already been arrived at by various independent authors of eminence<sup>2</sup>

<sup>1</sup> Tilt's 'Diseases of Women,' p. 95.

<sup>2</sup> Falret ('Des Maladies Mentales,' p. 299,) says, "Les fonctions génitales sont ordinairement conservées chez les aliénées, quelquefois même leur activité est accrue, quoique le trouble mental-n' ait point une origine érotique, cette sur-excitation des organes génitaux s'observe particulièrement dans le délire agité. Les fonctions génitales sont, au contraire, languissantes dans les délires tristes, cependant il est rare que l'appareil reproducteur soit frappé d'insensibilité ou d'impuissance excepté dans la paralysie générale. See also Morel 'Traité des Maladies Mentales,' p. 452.

The cases which were made the subjects of enquiry at the West Riding Asylum included 13 idiots and imbeciles, 1 cretin, 89 cases of epileptic insanity, 162 of mania, including acute, chronic, recurrent, and general; 22 of melancholia, 42 of dementia, 16 of delusional insanity, 1 case of monomania, 2 cases of moral insanity, 4 convalescent patients, 5 cases in which the menstrual condition was unknown, 13 cases of general paralysis, and 158 cases of old women, who had arrived at or passed the change of life; amounting altogether to a total of 528 cases.

### IDIOTCY.

The most remarkable fact observed amongst the idiots and imbeciles was that in them the establishment of menstruation was delayed beyond the normal time in exactly half the number of cases under observation. Enquiries were made concerning a few children, affected by insanity, to ascertain if, on the contrary, menstruation had in any case commenced earlier than usual, but in no instance had this occurred.

In Dr. Tilt's work on 'Diseases of Women' it is stated that the mean ages of the periods of first menstruation are, in hot climates, 13·9, in temperate climates, 14·94, and in cold climates, 16·41. Mr. Whitehead gives fifteen years six and three-quarter months as the average period at which menstruation begins, deduced from 4,000 cases in which he made this point the subject of enquiry. A delay in the advent of the catamenia is found, however, to be caused by bodily as well as mental diseases, but in that case it is due rather to an arrest of function than to an arrest of development. "In extreme degrees of cretinism the reproductive powers are never developed at all; and in less degrees menstruation appears late and continues scanty and irregular through life; whilst, even in cases of the slightest description, the average date of the first menstruation is as late as the eighteenth year."<sup>1</sup>

These facts correspond with a state of matters which we might reasonably expect to meet with in organisms stunted

<sup>1</sup> 'Report on Cretinism,' presented to the Sardinian Government in 1848. Quoted in Dr. West's 'Diseases of Women,' p. 34.



and contorted in every other point of their bodily and mental development.

Amongst 14 idiots, imbeciles, and cretins, 7, aged respectively 14, 16, 16, 18, 19, 22, and 22, had not begun to menstruate.

Of the remaining 7, 1, aged 19, always fainted during the periods, and at no other time in the month; and 1 became very excited at that time, and a third, suffering from right hemiplegia, had splenic pains and became maniacal when the courses appeared.

The other 4 idiots, aged respectively 22, 30, 33, and 36, were regular in every respect.

As a typical instance of menstruation delayed in idiocy, may be mentioned—

CASE 144.—A. W., æt. 18.—Admitted 24th Nov., 1870. A congenital imbecile. Mother died of phthisis. The father expressed his opinion that the child's imbecility was attributable to the mother having been terrified by the sight of a deformed idiot when pregnant. She had several brothers and sisters all perfectly sane and healthy. She remained stunted in physique and in intellect from her birth up to the time of observation. The conformation of the body in all respects resembled that of a child of about 9 years old. Although very stout, the mammæ were undeveloped, the hips were narrow, and she had never menstruated.

### MANIA.

It would appear from the observation of a large number of cases of mania that the exacerbations of excitement are, in many instances, due to the accession of the catamenial period.<sup>1</sup> This supposition is supported by two other facts, namely, that in cases of menorrhagia, where the sexual apparatus is in a

<sup>1</sup> Esquirol says on this point, 'L'époque des retours menstruels est toujours un temps orageux pour les femmes aliénées, même pour celles dont les menstrues ne sont point dérangées Des Maladies Mentales,' vol. i., p. 29. Greisinger also remarks, 'When menstruation continues during the mental disease, as it often does without the least derangement, it is not unusual to observe, with each return of the period, increased excitement, general increase of the mental disorder. In rare instances, insanity simply periodic, lasting during the menstrual period, with complete lucid intervals of several weeks' duration, has been observed.' See also Morel, p. 193.

state of constant irritation, the maniacal excitement is almost continuous; and that in cases of amenorrhœa, in which the generative organs are comparatively at rest, a condition of depression and melancholy frequently co-exists.

This exacerbation of the mental symptoms is merely one of the many instances of insanity being due to the irritation of peripheral filaments of the nerves. It is analagous to mental alienation being caused by ascarides, diseases of the ovaries, and visceral disorders of all kinds. But, on the other hand, we occasionally find instances in which mania is associated with more or less suppression of the catamenia. In such cases, it is not always easy to distinguish cause from effect. Sometimes it happens that an attack of acute mania, accompanied with congestion of the brain follows upon the sudden cessation or suppression of the menstrual flux. Here the maniacal attack is probably analagous to fevers caused by blood poisoning, the debris of the worn out tissues not being eliminated by one of the usual channels. If this state of things is allowed to continue, one of two results must ensue. Either the contaminated blood finds an unnatural exit, as is seen in cases of vicarious menstruation, or, not being discharged at all, it accumulates in the system, and causes severe constitutional and mental disturbance. Or again, it may happen that the suppression of the menses follows the manical attack. In this case the amenorrhœa is probably caused by the general state of anæmia and nervous exhaustion which are consequent upon the condition of mental excitement.

Similarly, it cannot fairly be stated that, in cases of recovery from mania, the return of the catamenia, always precedes the cure of insanity, in cases where the discharge has been suppressed. Frequently the order is reversed, the patient becomes sane and is discharged from the Asylum, but the monthly flux does not occur regularly for some weeks or months afterwards. The lesson to be derived from this fact, is that we should not direct our treatment too exclusively to the restoration of healthy uterine function. Van Der Kolk describes a case in which a lady became insane from the shock caused by her child dying in her lap in convulsions. She believed that she was dead, and required no food, and had many other strange delusions. She

eventually recovered, but the catamenia did not appear till some weeks after convalescence.<sup>1</sup> But on the other hand there are many cases on record in which the recovery followed very soon after the re-appearance of the catamenia.

Esquirol gives a long account of an interesting case, in which a lady was under the delusions, that her husband was unfaithful to her, and that every man who approached her wished to violate her honour. It was complicated with great disorder of the secretions and an obstinate condition of amenorrhœa. The courses re-appeared on the day following a carriage drive, and the bodily and mental disorders were at once dispelled.<sup>2</sup>

Pinel quotes a case in which amenorrhœa was produced in a young lady, by a draught of cold water, taken after a long hot walk. This was succeeded by rigors, heat, languor, loss of memory, and delirium. After much resistance to treatment, the uterine function was restored, and the maniacal condition at once disappeared.<sup>3</sup>

In puerperal insanity the outlook is favourable on the return of the catamenia, and in any case an amelioration of the mental symptoms at the monthly period, may be looked upon as a favourable omen.

One hundred and sixty-two cases of mania were investigated. Of these, four only were suffering from menorrhagia.

The first and second, cases 275 and 364, were almost always in a maniacal condition. The third had irregular accessions of menorrhagia, was invariably in a state of excitement and full of erotic delusions, the most prominent one being, that she was going to marry all the other females in the ward.

The fourth case was very typical, Case 32. D. A., æt. 38. Married. Was admitted on the 10th of July, 1866, suffering from puerperal insanity. She was at first restless and sleepless at nights, wandering about the dormitory in a purposeless manner, but by degrees her mind cleared up, and was succeeded by a condition of chronic mania, almost unbroken by any intermission. She was a tall powerful woman, and frequently attacked the nurses with the utmost violence. These paroxysms

<sup>1</sup> Van Der Kolk on 'Mental Diseases, p. 147.'

<sup>2</sup> 'Des Maladies Mentales.' Vol. i. p. 364.

<sup>3</sup> 'De l'Alienation Mentale,' p. 51.

of excitement at first used to occur before, but latterly they occurred during the catamenial period. She suffered from constant menorrhagia, and her language and habits at all times were very obscene, but usually became more offensive at the monthly periods. She has made indecent overtures to one of the nurses, has exposed her person to a male patient at the window, and has been caught in the act of manipulating another female patient. She is always in a most erotic condition. In her case menstruation is sometimes vicarious, and occurs by bleeding from the nose, and on these occasions there is less vaginal discharge.

Out of 162 cases of Mania, no less than 99, or about two-thirds of the total number had attacks of excitement which could be distinctly referred to the catamenial period.

Of these 99, in eleven instances the maniacal excitement was observed to occur at periods varying from one day to a week before the accession of the catamenia, in one case the exacerbation took place immediately after the menses had passed away, and in one case, the attacks of excitement occurred during the intervals between the courses. In the remaining 86, the mania appeared to occur, and to be at its worst, during the period of the catamenial discharge.

In 52 patients suffering from mania who menstruated in the normal manner the excitement could not be in any way connected with the catamenial periods.

Seven patients only were suffering from amenorrhœa in a more or less marked degree.

Cases of Mania in which the excitement appeared to be decidedly connected with the catamenial periods.

CASE 60.—M. A. P., æt. 31. Single.—Admitted 1st Oct., 1860, in a feeble demented condition. She gradually improved and became a useful patient in the wards, but was of a jealous disposition, and unless taken notice of by the doctors on their visits, would break windows and do other damage. At the catamenial period she behaved "like a fiend," attacking patients and nurses indiscriminately, and using very foul and offensive language. This patient and D. A., the one mentioned under menorrhagia, used to combine together, to commit mutual acts of indecenoy, and were in the habit of making

overtures to male patients and others passing the windows of the wards. She was a comparatively quiet and well behaved inmate in the intervals between her monthly courses.

CASE 47.—Suffered from leucorrhœa.

CASE 50, æt. 53.—Was irregular, and always became very faint and ill when the discharge occurred.

CASE 151.—Had splenic pains and used indecent language at that time only.

CASE 157.—Tore up her clothes.

CASE 164.—Became very violent and dangerous.

CASE 166.—Was always in an excited condition, but became dirty in her habits at that time only.

CASE 178.—Resorted to manustupration at the time.

CASE 183.—Became very erotic and obscene.

CASE 244.—Was irregular, became maniacal before the discharge, and at the time suffered from splenic pain and dysmenorrhœa.

CASE 324, æt. 46.—Had had ovariectomy performed on one side, but menstruated regularly and became much excited at the time.

CASE 355.—Sometimes suffered from headache, at other times sang songs at the period.

CASE 404.—Became excited every two months only, but as she managed to conceal any signs of menstruation, it was impossible to connect the mental disturbance with that function.

CASE 407.—Was regular, but about once a year became excited at the time.

CASE 523.—Became very quiet and reserved at the period, but was always much excited in the intervals.

CASE 252, æt. 46.—Suffered from chronic mania which was exacerbated at the monthly periods. Menstruated regularly once a month vicariously from the nose, and never in the usual manner.<sup>1</sup>

<sup>1</sup> Vicarious menstruation was not unknown to the ancients. We read in Celsus "*Sæpe fœminæ quibus sanguis per menstrua non respondet sanguinem expuunt*;" in Hippocrates, *Γίνεται λύσις γυναικὶ ἐμειούσῃ ἅμα τῶν καταμνηνίων βαγίνταν*,—A woman is cured of vomiting blood when the catamenia commence; and in Aretæus, *Τόδε τὸ εἶδος τῆς ἀναγωγῆς γυναιξὶ ὡς ἐπίπαν ὅν καθαίρομένησι τὰδε ἐπιμήνια γίνεσται*.—This mode of bringing up blood is common with women who have not their monthly purgation.



Of the 52 cases in which excitement could not be in any way connected with the catamenial function, the following are somewhat remarkable :—

CASE 32.—A masturbator, always erotic.

CASE 232.—Regular. Suffered from leucorrhœa, and was at all times liable to attacks of mania.

CASE 288.—Regular. Stout but feeble, and suffered from abscesses. A chronic maniac, and addicted to painting the walls of her room with fœces.

CASE 330.—Regular. Had a scirrhus of the breast. Always excited.

CASE 338.—Regular. Commenced menstruating and married at thirteen. Had a child a year after, which lived only a few minutes. Her husband deserted her and she became insane. Always very erotic.

Of the 7 cases of amenorrhœa occurring in mania, one only is worthy of notice.

CASE 457, æt. 20.—Suffering from phthisis, chronic vomiting, ulcerated legs, and paralysis of the right arm. In this case, the bodily condition sufficiently accounted for any irregularity.

### EPILEPSY.

An increase in the number of fits and maniacal excitement were observed to occur in many instances at the monthly periods.

Brierre de Boismont and Dr. Tyler Smith have both seen cases of hysterical and epileptic attacks occurring at the catamenial discharge, and Dr. Beau concluded that 35 out of 127 cases of hysteria and epilepsy coincided with the period of menstruation.<sup>1</sup> Dr. Ramsbotham produced an epileptic attack in a sensitive patient by simply pressing his hand on the neck of the womb.

The cases of 89 epileptics were made the subject of enquiry. The mental condition was in most cases that of dementia with excitement, but in a few instances dementia and melancholia were represented.

In 18 of these 89 cases neither epileptic attacks nor maniacal excitement could be traced to the catamenial condition. But in 27 cases the epileptic fits were either more numerous or

<sup>1</sup> 'Recherches statistiques.'

occurred only at that time; in 11 cases maniacal excitement alone occurred; and in 28 cases there was an exacerbation both of the epileptic seizures and of the maniacal condition at the menstrual periods.

Four epileptics suffered from amenorrhœa, and of these 4, 3 had ceased to menstruate from old age. This last fact is remarkable as showing the effect of epilepsy in shortening life, since only 3 in 89 epileptics had reached the ménopause.

Of the 18 cases in which the epileptic attacks could not be connected with the menstrual flux, the following are not without interest:—

CASE 87, æt. 32.—Regular. The epileptic fits ceased five months ago, and she is now convalescent.

CASE 342, æt. 32.—Dementia after epilepsy, suffered from amenorrhœa.

CASE 369, æt. 43.—Epileptic mania; regular once a month, had epileptic attacks regularly once in six weeks, not at the menstrual period.

CASE 491, æt. 21.—Epileptic mania, menstruated once in every two months only.

Of the 27 cases of epilepsy occurring in connection with the catamenial period, perhaps the following is the most typical instance:—

CASE 378.—S. L., æt. 38.—Admitted 3rd Nov., 1866. Two years before her admission she received a blow on the head. After that occurrence she became “nervous,” and six months later the disease assumed the form of melancholia. She was full of delusions, as that her body had been changed, and that before that event she was the most beautiful woman in the world. She would sit all day with her apron over her head, and preferred seizing her food with her hands to eating with a knife and fork. She had one fit monthly, and one only, on the occurrence of the catamenia, which came regularly once a month, and extended only over twenty-four hours. During the remainder of the month she was perfectly free from epileptic attacks.

The following deserve a passing notice:—

CASE 9.—Had a great number of fits before menstruation originally commenced. Since that time the attacks have been

fewer in number, and have occurred only at the catamenial discharge. She is very erotic and addicted to swearing and blasphemy.

CASES 11 and 302.—Both regular, suffered from menorrhagia. Fits multiplied at the monthly periods.

CASE 44.—Was very troublesome to the attendants at the time, rushing about the ward shouting and screaming.

CASE 195.—Became excited about a week before the discharge.

CASE 287, æt. 35, very stout.—Became epileptic at the times, and, falling in her fits, frequently broke some bone. In this way the clavicle, femur, and radius have been fractured.

CASE 308.—Regular once a month. Had fits every alternate month only, at the periods, but the attacks could be warded off by Bromide of Potassium.

CASE 313, æt. 36.—Very irregular, there being intervals of six or eight weeks between the courses. Exacerbations of epilepsy during the discharge.

CASE 325, æt. 32.—A similar case, with intervals of five or six weeks. Suffered from phthisis.

CASE 431, æt. 40.—Fits increased, and very violent and destructive at the times.

CASE 437, æt. 30.—Suffered from cephalalgia and splenic pain before the courses appeared. Epileptic only at that time.

Of the 11 cases in which excitement occurred only at the monthly period, and in which no distinct increase in the number of epileptic attacks could be made out, the following are interesting:—

CASE 453. M. A. W., æt. 48.—Admitted 1st March, 1872, in a state of sullen dementia. She laboured under delusions of suspicion, as that the neighbours were watching her through holes in the wall. She menstruated regularly, and had usually four or five fits during the catamenial period. If the epileptic attacks did not occur, she became fearfully maniacal and dangerous.

CASE 16, æt. 35.—Very dangerous at the period, and at no other time.

CASE 91, æt. 40.—Very destructive. Discharge very scanty.

CASE 305, æt. 20.—Very stout and florid. More fits at the time. Has suffered from menorrhagia.

Selections are here given from the 28 cases in which the epileptic seizures and maniacal condition both occurred at the menstrual period.

CASE 136, æt. 22.—Fits increased in number. Is very dangerous at the time. In the intervals completely demented.

CASES 181 and 200.—Both had more fits, and became excited a few days before the courses appeared.

CASE 392, æt. 39.—Menstruated up to three months ago. Since then the catamenia have ceased. She used formerly to become maniacal and epileptic before and during the discharge. Since that has ceased the fits have been fewer in number and the excitement has diminished.

CASE 427, æt. 40.—Catamenia ceasing, but at the time her courses ought to appear she becomes maniacal and also very stupid, requiring to be fed with a spoon.

CASE 493, æt. 19.—Has never menstruated.

CASES 192 and 458, both æt. 36.—Never menstruated. The former is a dement, the last suffers from phthisis.

CASE 140, æt. 48.—Epileptic dementia. Catamenia have ceased.

### MELANCHOLIA.

In melancholia "the uterine functions are more or less disordered and are suspended in the large majority of cases."<sup>1</sup> Sometimes it is not easy to state what is the pathology of such cases. The general condition of anæmia may produce amenorrhœa and hence melancholia, but amenorrhœa and melancholia are also sometimes the result of a plethoric condition of the system. "Many patients, in consequence of plethora uteri, imagine themselves pregnant, and lament the disgrace which they thereby incur, but this delusion vanishes with the return of the period."<sup>2</sup>

The recurrence of menstruation, coincident with an improvement of the mental symptoms, always justifies our giving a favourable prognosis. If, on the contrary, there is no amelioration in the intellectual condition upon the return of the

<sup>1</sup> Bucknill and Tuke's 'Psychological Medicine.' See also Falret's work, p. 300, and Morel, p. 194.

<sup>2</sup> Van Der Kolk on 'Mental Diseases,' p. 144.

catamenia, it is probable that the case will end in hopeless dementia.

Of the 22 cases of melancholia which were enquired into, 15 were regular, and 7 suffered from amenorrhœa.

It will at once be seen that this is a very large proportion of instances in which there was a deficiency of the catamenial discharge, and it presents a great contrast to the number of cases occurring in mania, where 7 cases of amenorrhœa existed against 52 who were regular, or in 174 cases of mania altogether.

The following are typical instances of melancholia, in which the apparently exciting effect of the menstrual period was exhibited.

CASES 129 and 521.—Both became invariably more lively and cheerful at the time the catamenia made their appearance, and relapsed into a state of profound melancholia on their cessation.

CASE 133, æt. 27.—Always became much more depressed at the menstrual flux, and

CASE 359.—Always suffered from intense cephalalgia at that period only.

The following is a typical case of amenorrhœa and melancholia :—

CASE 390. H. T., æt. 30.—Six months before admission a neighbour of hers became insane and set fire to his house, and then rushed out and seized her roughly, which caused her much alarm. At the time she had been suckling a child for a year and nine months. She became melancholic and attempted suicide by cutting her throat twice in the course of six weeks. She suffered from leucorrhœa, and the catamenia were completely suppressed, although she had left off suckling six months before admission.

CASE 421.—Suffered from chronic vomiting. The menses were in this case so scanty that it almost amounted to a case of amenorrhœa.

#### DEMENTIA.

It is a well-known fact to psychologists that when the bodily health improves or remains good, and there is no amelioration



in the mental condition, the prognosis is unfavourable, and the patient will probably sooner or later become demented.<sup>1</sup> As might have been expected in such cases, the catamenial function, in common with those of other organs, is generally discharged with great regularity. Amongst 42 cases of dementia, exclusive of epileptics, and inclusive of cases of acute and secondary dementia, no less than 32 were regular in every respect, 8 suffered from amenorrhœa, and in 2 cases, both of whom had been in the asylum under a month, nothing was known of the monthly discharge.

CASE 264, æt. 48.—Was regular, although in feeble health and suffering from mollities ossium.

CASE 304, æt. 35.—Stout and florid. At the catamenial period was under the delusion that an old woman in another ward was her husband.

CASE 389, æt. 17.—Regular. Displayed a slight return of intellect and excitement at the discharge.

CASE 406, æt. 38.—Regular. Became very disagreeable to those about her; used foul language and masturbated at the time.

CASE 438, æt. 48.—Regular. At the monthly period became more demented than usual, requiring to be fed and dressed at that time only.

Eight cases of amenorrhœa and dementia. Of these

CASE 99, æt. 34.—Was very irregular, and menstruated sometimes at short, sometimes at long intervals.

The other 7 cases presented no points of interest.

#### DELUSIONAL INSANITY.

Sixteen cases were investigated. Of these, 13 were regular, 1 suffered from menorrhagia, and 2 from amenorrhœa.

Of the 13 cases who menstruated regularly,

CASE 428, æt. 42.—Was full of delusions. She fancied she was the Scarlet Lady, and that she had power over the spirits of the air. She was quite regular, but became somewhat abusive and suicidal at the catamenial period.

CASE 501.—Regular. Always became more lively and cheerful at the time.

<sup>1</sup> Pritchard on 'Insanity,' p. 208.

CASE 547.—Regular. Suffered from headache at the monthly period only.

*Menorrhagia*.—CASE 228, æt. 46.—Full of delusions.

*Amenorrhœa*.—CASE 418, æt. 47.—Suffered from chronic peritonitis. Always became very dignified, sullen, and cross at the periods of the discharge.

CASE 142, æt. 60.—Catamenia had ceased. Prolapsus uteri. Believed that her dead children were buried behind the wall of the asylum.

CASE 554, æt. 30.—No Catamenia.

One case of Monomania :—

CASE 240, æt. 47.—Regular, but suffered from splenic pain, headache, and dysmenorrhœa at the time. Had only one delusion, that a viper was lodged in her throat which no purgative or emetic would ever get rid of.

Two cases of Moral Insanity. Both regular :—

CASE 465, æt. 18.—Became very destructive and mischievous at the time of the discharge, stealing things and hiding them to annoy the nurses.

Four cases of convalescent patients about to be discharged from the asylum. Three regular, and one had amenorrhœa :—

CASE 394.—Partially recovered from epilepsy. Used to become much excited at the period, and the number of fits was then increased. Is now perfectly sane and quiet, but occasionally has an epileptic attack.

CASE 123.—Quite recovered from mania.

CASE 176. — Also convalescent, but is easily put out of temper.

CASE 276, æt. 43.—Quite restored to health. No catamenia.

Five cases in which the condition of the menstrual function was unknown.

In 3 of these, the reason assigned was that they had been in the asylum less than a month.

#### GENERAL PARALYSIS.

Suppression of the catamenia at an early age was found in a large proportion of instances. I am unable to discover that this fact has come under the observation of any writer on mental

diseases. It is difficult at first sight to account for it in any way. I venture, however, to offer two suggestions in explanation of the cessation of the catamenial discharge in this form of mental disorder. In the first place, one of the theories of the pathology of general paralysis assumes that this disease is due to diminution of the calibre of the vessels of the brain. If this diminution exists in the vessels of that organ, why should it not also be present in the vessels of the uterus? Hence a smaller quantity of blood would proceed to the ovaries, and these bodies being already predisposed to a sluggish performance of their function by the general state of depression of the whole system, amenorrhœa would naturally be the consequence.

In the second place, it has been found by the writer that in general paralysis of the insane there is a large increase in the white corpuscles of the blood at the expense of the red globules, which undoubtedly shows that a condition of anæmia exists. Amongst the sane anæmia is frequently the cause of amenorrhœa, and there is no reason why the same cause should not operate just as forcibly in constitutions already lowered and depressed by a disease which is almost universally acknowledged to be slowly but surely fatal.

Thirteen cases of General Paralysis were enquired into. In these 13, 3 were too old to menstruate, namely, case 320, æt. 53; case 452, æt. 46; and case 520, æt. 55.

Excluding these 3, 10 remain, of whom 4 only menstruated regularly, being aged respectively 31, 29, 34, and 32.

The remaining 6, or  $\frac{3}{5}$ ths of the number who had not arrived at the change of life, never menstruate. Their ages respectively are 34, 40, 30, 33, 40, and 35.

Perhaps 2 of the above, æt. 40, may have stopped naturally, but, in any case, 4 out of the 10 ceased menstruating earlier than usual, and this fact ought not to pass unnoticed.

Of the 4 cases who menstruated regularly, the following are worthy of remark:—

CASE 398. A. E. B., æt. 30.—Admitted 10th May, 1871. On admission she was much depressed, but very obscene in her language, detailing at length the acts of her husband, who, she said, used to have connection with her against her will.

She had attempted to cut his throat, and had behaved very unkindly to her children. All the symptoms of general paralysis were well marked. She had had 2 children, and the catamenia had not appeared since her last confinement. On the morning of the 2nd of September, 1871, she suddenly became temporarily paralysed in her left arm and leg. This attack of hemiplegia was followed, on the 14th and 29th, by epileptiform convulsions. It was uncertain whether or no the catamenia reappeared at the time of the paralytic seizure, but this is certain, that up to the present time she has invariably suffered from left hemiplegia at the menstrual periods only, and that she completely recovers the use of the arm and leg in the intervals.

CASE 408, æt. 29.—Regular. Suffered from dysmenorrhœa, accompanied with headache, splenic pain, and sickness. She had a child born in the asylum two years ago.

CASE 435, æt. 34.—Partially aphasic. Regular.

CASE 451, æt. 32.—Regular. Suffered from epileptiform convulsions at the catamenial period.

Six cases of amenorrhœa in General Paralysis:—

CASE 289, æt. 34.—No catamenia. She affirmed that she was pregnant, but this was a delusion.

CASE 420, æt. 40.—Very feeble. Aphasic. No catamenia.

CASE 439, æt. 40.—Also aphasic. No catamenia.

CASE 422, æt. 30.—No catamenia. Occasional convulsions.

CASE 436, æt. 33.—In good health. Aphasic. No catamenia.

CASE 446, æt. 35.—Demented. No catamenia.

It will be observed that in 3 of the above 6 cases, aphasia existed, with suppression of the menses, 1 case only of aphasia existing in 4 cases where the discharge was regular. It would appear from this that amenorrhœa is a sign of the disease having made some advance, as the more severe paralytic symptoms are found in the later stages of general paresis.

#### THE CHANGE OF LIFE AND OLD AGE IN RELATION TO THE MENSTRUAL FUNCTION.

When it is considered what a disagreeable effect the change of life has upon a large proportion of women, it is not to be wondered at if insanity is found playing a part amongst the

many disorders to which that period is liable. Amongst the sane, the following symptoms are frequently noticed at this critical epoch:—An intolerable garrulity, a perpetual finding fault with relatives and servants, a love of scandal and mischief-making, vague suspicions and jealousies, an extreme idea of self-importance, a readiness to take offence at the slightest trifles, an exaggeration of facts almost amounting to lying, an irritable temper, and excessive personal vanity. Dr. Tilt states that 3·2 per cent. of women who suffer from nervous diseases at the change of life become insane.<sup>1</sup> The forms of insanity found at this epoch include mania, melancholia, hypochondriasis, dipsomania, kleptomania, and lastly homicidal and suicidal mania. Brierre de Boismont states that in France 1 woman for every 3 men commits suicide, and that the greatest number of suicides are found to occur in women between the ages of 40 and 50, or at the time of the cessation of the catamenial discharge.

The average date of the cessation of menstruation is fixed by Dr. Tilt at 46·1 years, by Dr. Guy at 45·8 years, and by Brierre de Boismont at 44·0 years, and the average of these three periods is 45·7 years.

It is a common occurrence amongst prostitutes for menstruation to cease for periods varying from two or three months to two or three years,<sup>2</sup> and occasionally cases are met with of this function being again established in old age, but it is very uncommon for the catamenia to reappear in this way after any very prolonged cessation. Dr. Tilt mentions the case of a lady who menstruated regularly up to the time of her death, in her 84th year. Dr. Meyer, of Berlin, found 3 cases, out of 6,000, who did not cease menstruating until 64. Lamotte relates that a woman had 32 children, and menstruated quite regularly up to her 62nd year. Auber attended two women, one 68 and the other 80, who were quite regular. Rush mentions the case of a woman who was confined for the last time in her 60th year, menstruated until her 80th, and died in her 100th year. Saxonia states that a nun, in whom the menstrual flow ceased

<sup>1</sup> Tilt on the 'Change of Life,' p. 184.

<sup>2</sup> Parent du Chatelet. 'De la prostitution dans la ville de Paris.' Vol. I., p. 215.



at the usual time, experienced its return when her 100th year was attained, and it continued regular till her death three years after.<sup>1</sup> But all these are very exceptional cases.

Amongst 158 old women whose cases were enquired into, 4 were found in whom the catamenia had reappeared late in life. The patients in whom this phenomenon occurred were in two instances more than 60 years old, and in two others more than 70, but in 3 of the 4 the age was not more accurately known. The only fact that was certainly known about them was that the flux in all cases was not due to menorrhagia or any morbid uterine action, but that it existed as a regular healthy catamenial discharge.

CASE 31.—E. D., æt. 66, on admission on 10th Dec., 1866, now æt. 70, was admitted suffering from senile dementia, having had several previous attacks of insanity, the first when æt. 30. She had been noisy, dangerous, and dirty in her habits at home, but improved under treatment. On the 5th August, 1868, when æt. 68, a profuse sanguineous discharge was observed to take place from the vagina. This was somewhat checked by Iron, but it continued to occur regularly once a month up to February, 1872. In April, 1872, it had not occurred for two months, so that it was again probably ceasing.

Of those who were too old to menstruate nothing need be said. One case, however, was somewhat curious:—

CASE 537, æt. 54.—Had long since arrived at the change of life, but endeavoured to persuade the nurses that she was about to commence menstruating again. In this case it was an entire delusion.

Thus have been traced the intellectual disturbances associated with the menstrual function, from the age of puberty till the occurrence of the change of life. I have endeavoured as much as possible to avoid theories in my remarks, the facts collected speak for themselves, and I trust they may prove of some service to the psychologist and the obstetric physician.

<sup>1</sup> Tilt, on the 'Change of Life,' p. 25.

EXPERIMENTS TO ASCERTAIN THE EFFECTS  
OF  
ETHER AND NITROUS OXIDE COMBINED,  
TO WHICH ARE ADDED  
SOME GENERAL OBSERVATIONS ON STIMULANTS.

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The well-known safety of Ether and Nitrous Oxide as anæsthetics led me to hope that by administering them simultaneously it might be possible—still retaining this indispensable quality of safety—to obtain results which neither, inhaled separately, can give, viz., a convenient rapidity of action and a comparative permanence of effect; for though Ether is universally admitted to be one of the safest anæsthetics yet discovered, and one from the effects of which patients do not too quickly recover, it has fallen into desuetude on account of the slowness with which it acts; whereas Nitrous Oxide, though capable of inducing a state of anæsthesia in little more than one minute, is so quickly exhaled that the patient is as keenly alive to suffering in from twenty-five to thirty-five seconds after ceasing to inhale it as before its administration was begun.

Experience has taught that a totally unforeseen class of symptoms frequently results from the combined action of two or more powerful drugs. I deemed it necessary, therefore, first to ascertain what effects the combination of Nitrous Oxide and the vapour of Ether had on the lower animals. For this purpose I selected rabbits, and that the results might be more readily compared, and an unnecessary number of experiments avoided, they were made on these animals solely. The rabbits employed

were all of nearly the same age, size, and strength, being from four to five months old, and nearly full grown.

As it was necessary to work with a constant atmosphere during each experiment, and to know, approximately at any rate, the proportion of air, Ether vapour, and Nitrous Oxide used, I employed, in all the experiments, an air-tight glass case of 3,500 cubic inches capacity, with an apparatus so adapted that the case, containing any proportion of air, &c., could be balanced over water. Thus the animals experimented on were passed under water, and placed on a table floating within the case, by which means not only was an atmosphere of constant proportions secured, but facilities were afforded for testing sensibility at any moment of the operation of the anæsthetic, as the animal could be readily reached, at every part of the case, by the hand passed under water.

In the first experiment, the animal was introduced into an atmosphere of pure Nitrous Oxide. For a few seconds, except that respiration was somewhat accelerated, no change was observed. In eighteen seconds it made a few spasmodic movements, general convulsions immediately following. In twenty-five seconds the convulsions assumed a tonic character, the animal becoming quite rigid. In ten seconds more a state of complete flaccidity of all the muscles succeeded, and no signs of life were manifested. The heart and lungs had ceased to act. At the end of thirty-five seconds the rabbit was taken out, when it almost immediately gasped, and completely recovered in five minutes.

Experiment 2.—A rabbit was placed in an atmosphere composed of Nitrous Oxide three parts, common air one part. In twenty-two seconds it began jumping about excitedly, and, raising itself on its hind-legs, fidgeted with its fore-legs as if trying to escape. In thirty-seven seconds it lost its equilibrium, falling over on its side; recovering itself, it remained still for four or five seconds, when, on being disturbed by a slight movement of the case, it gave a violent bound, after which every motion was of a convulsive character. It uttered low cries. The heart's action was very laboured, and the breathing of a panting character. In one minute and thirty seconds it lay on its side, without power to recover the sitting posture, and re-

quired to be sharply pinched before any sign of feeling could be elicited, and then the leg was convulsively withdrawn. Anæsthesia was not complete until it had remained in the case eight minutes, when all means failed to produce reflex movements. All its limbs hung flaccid when it was removed at the end of nine minutes, and the heart's action and respiration were very feeble. The animal quickly recovered, showing signs of feeling in less than a minute. In an experiment, in which equal parts of air and Nitrous Oxide were employed, the symptoms were the same as in the last experiment but were longer in appearing.

Some experiments were next made to test the effects of Ether vapour. After breathing air containing about 2 per cent. of the vapour for twelve minutes, the rabbit seemed to be very little affected.

An atmosphere charged with 4 per cent. of Ether vapour produced more marked effects. In six minutes the animal was very drowsy, and, when disturbed, staggered a good deal on attempting to jump. In ten minutes these symptoms were more strongly marked. In fifteen minutes the animal was insensible to slight pinching—when the paw was strongly compressed, however, it was withdrawn with a sharp, jerking motion. In thirty minutes it lay on the table quite powerless, though, when irritated, it was still capable of faint reflex movements: heart's action, throbbing: respiration, gasping. On being removed, recovered in about five minutes.

In an atmosphere charged with 7 per cent. of Ether vapour, drowsiness and want of power to co-ordinate movements perfectly were observed in two minutes. Reflex movements could be caused by severe pinching even at the end of twenty minutes, at which time the breathing was shallow and undulatory in character: the reflex movements following irritation were of a distinctly convulsive character, and were followed (without repetition of the irritation) by twitchings of the limbs; similar twitchings, in some instances, extending over the whole body. When withdrawn, recovered slowly.

Experiments were next made with mixed atmospheres of Nitrous Oxide, Ether vapour, and air. A rabbit was introduced into an atmosphere composed of three-fourths Nitrous Oxide,

and one-fourth air, through which Ether vapour was diffused in the proportion of  $2\frac{1}{2}$  per cent. In thirty-seven seconds after its introduction, the animal fell down, its attempts to recover the sitting posture being unavailing. In one minute there was a moderate degree of rigidity of the muscular system generally. At the end of one and a half minutes no sign of feeling followed severe pinching. In two and a half minutes the whole body was flaccid: respiration hurried and of an undulatory character: the pulsations of heart seemed to be made with greatly increased force. A very faint reflex movement of the eyelid took place when the finger was slowly passed over the conjunctiva. At nine minutes, was removed almost lifeless, but, after a few gasping inspirations, slowly recovered.

The next experiment was made with a combination of one-half Nitrous Oxide, and one-half common air, through which, when mixed, 6 per cent. of Ether vapour was diffused. In one minute after the animal had been introduced within the case, slight loss of power in the limbs was noticed. In one minute thirty seconds it became very restless, and staggered greatly in its attempts to jump about. In three minutes the hind legs were almost completely paralysed, though they were withdrawn when sharply pinched. At the end of eight minutes but very faint reflex movements followed irritation. Was removed and recovered quickly.

In an atmosphere of the same composition as in the last experiment, except that the Ether vapour was in the proportion of 8 per cent., the rabbit showed no signs of feeling at the expiration of five minutes, even when the finger was passed slowly over the conjunctiva. Was removed almost lifeless at the ninth minute. Recovered.

Numerous experiments were also made with Chloroform; and with combined atmospheres of Nitrous Oxide, Chloroform vapour, and air. The following experiment will show the effects of Chloroform alone:—

A rabbit was placed in the case containing air charged with nearly 7 per cent. of Chloroform vapour. In less than a minute its head began to droop, and it seemed very drowsy. In two minutes, slight pinching of the paw produced no effect, but it was convulsively withdrawn when severely pinched. In two



minutes forty seconds, there is almost complete paralysis of limbs: hurried, gasping respiration: strong throbbing of the heart. In four minutes thirty seconds, complete flaccidity of the limbs and profound anæsthesia. In five minutes fifteen seconds, withdrawn; recovery slow.

Another rabbit was made to breathe an atmosphere of Nitrous Oxide one-half, air one-half, diffused through the whole Chloroform vapour to the strength of 5 per cent.

In half a minute after introduction, the animal was seen to stagger on attempting to turn round. In forty seconds, lost command over its limbs, not being able to maintain the sitting posture. In one minute thirty seconds, lies paralysed; very faint reflex movements follow the touching of the conjunctiva; respiration slow; heart's action laboured. In two minutes ten seconds, in a condition of profound anæsthesia. In nine minutes fifteen seconds, respirations one hundred and thirty-four, shallow. In ten minutes, heart's action and respiration suddenly ceased. The animal was immediately withdrawn, quite dead.

In none of the other experiments, although atmospheres of almost equal strength were employed, and the animals exposed to them for the same length of time, did a fatal result follow.

Having thus ascertained the effects of the combined atmospheres on the lower animals, I next proceeded to experiment on myself, and on such of my friends as were willing to join me in the investigation.

As, however, I have not yet had an opportunity of testing their effects on any one undergoing a surgical operation, the results arrived at have unavoidably been of a somewhat inconclusive character. I found much difficulty, too, in obtaining a suitable inhaler. The one made for me to measure the proportions of air, Nitrous Oxide and Ether vapour used, was found to be so faulty in construction as to be practically useless, so that I had to fall back on the ordinary apparatus for inhaling Nitrous Oxide (when used in the compressed liquid form) with the slight modification, that to the Clover's face-piece a Murphy's inhaler was attached. Thus the usual orifice for that purpose admitted the Nitrous Oxide, while, by the orifice for the supplemental bag, air charged with Ether vapour passed in. By

changing the position of the valve of the inhaler the quantity of air admitted could be increased or diminished.

Many experiments were made, the results of which I will give as briefly as possible.

Dr. E—— and I found that we could breathe the vapour given off, when from four to six drachms of Ether were placed in the inhaler (its valve being left three-quarters open), for eight minutes, without its producing unconsciousness: the effects being some degree of tingling and numbness of the extremities with confusion of mind.

The effects of Ether combined with Nitrous Oxide are seen from the following experiment. Six drachms of Ether were placed in the inhaler, the valve of which was left quite open. Air charged with Ether vapour was breathed for one minute without its producing much effect. Nitrous Oxide was then admitted which almost immediately neutralised the unpleasant taste and odour of the Ether—as well as the feeling of want of air. The approach of unconsciousness which was rapid, was accompanied by much less vivid feelings than when Nitrous Oxide is used alone; and there was simply a pleasurable feeling of repose, with numbness and tingling of the extremities. Immediately before falling into unconsciousness a profound sense of depression at the epigastrium was experienced. In four and a half minutes no sign of feeling followed when the skin of the hands or face was pinched, though the conjunctiva did not seem to have wholly lost its sensibility. The inhalation was continued until the end of seven minutes, when the anæsthesia was complete—no reflex action taking place when the finger was passed over the conjunctiva. The inhaler was then removed; signs of returning sensibility were observed in little more than a minute. Numbness of the extremities and a feeling of extreme drowsiness continued four or five minutes.

On another occasion when the same quantity of Ether was employed—the valve also being left open, and air charged with Ether vapour breathed alone for one minute—when the Nitrous Oxide was turned on, I quietly and rapidly became unconscious, and profound anæsthesia was induced in rather less than four minutes. Mr. J——, who was assisting me, noticed that just before complete anæsthesia the pulse was small and very slow.

Recovery of consciousness took place in about a minute, but numbness of the extremities continued for three minutes.

Mr. J—— inhaled the same proportion of Ether vapour and Nitrous Oxide, the latter being admitted one minute after the commencement of the experiment. The stage of excitement was, in this instance, very well marked, and lasted nearly a minute. At the end of three minutes, however, the breathing became loud and stertorous. There was complete anæsthesia in three and three-quarter minutes from the commencement. The inhaler being removed, he regained consciousness in about one minute.

A few experiments were also made with Chloroform vapour and Nitrous Oxide.

The same apparatus being used, forty-five minims of Chloroform were poured into the inhaler: the valve was left quite open. Dr. E—— first breathed air charged with Chloroform vapour for thirty seconds, when the Nitrous Oxide was admitted. Without previous symptoms of excitement, muscular rigidity, assuming a cataleptic character, began to appear in one and a half minutes, continuing rather more than a minute. As this condition was passing off, and as pinching of sensitive parts no longer elicited signs of feeling, in three and a half minutes from commencement, the inhalation was discontinued. Consciousness did not return for nearly two minutes, and was accompanied by a feeling of extreme drowsiness and depression, with some tendency to sickness. Dr. E—— had, on another occasion, inhaled Chloroform vapour and air of double the strength of the above for four and a half minutes without having been rendered unconscious.

In the course of the numerous experiments made with combined atmospheres of air, Ether vapour, and Nitrous Oxide, even when the profoundest anæsthesia has been produced, there has never occurred that deep lividity of the face, and the convulsive twitchings which so frequently accompany the administration of the pure Nitrous Oxide.

In experiments on myself vomiting has followed the inhalation of even moderate quantities of Chloroform, but Ether and Nitrous Oxide combined have never had that effect. As the Nitrous Oxide neutralizes the pungency of the vapours of

Ether and Chloroform, when combined with them, it has the power of removing the sense of suffocation experienced when they are breathed alone. The long persistence of the feelings of numbness in the extremities is a phenomenon never observed when the pure Nitrous Oxide is employed to produce anæsthesia. I need scarcely point out its practical importance in surgical operations.

Dr. Snow's conclusion, after having carefully analysed all the recorded cases of death from Chloroform inhalation, was that the fatal result was due, in the majority of instances, to paralysis of the heart; in many cases it was remarked that respiratory action continued when but very feeble and intermittent cardiac contractions could be detected. It is known that Nitrous Oxide is exhaled with the greatest facility. Would it not seem probable then, if this gas formed one of the elements producing anæsthesia, that the interchange of it with Oxygen, given *any* pulmonary activity, would always be sufficiently rapid to avert a fatal result in cases where these dangerous complications arise?

Our views of the mode of action of anæsthetics appear to be somewhat indefinite and confused. From their effects on myself, and those observed in others, as well as in the lower animals, I have been led to doubt the correctness of the views generally adopted. Let us see what they are. In his work on 'Stimulants and Narcotics,' Dr. Anstie writes, "Most, if not all narcotics,<sup>1</sup> when given in smaller doses than those required to produce the lesser degrees of narcosis, act as stimulants."

That the time honoured theories in explanation of the actions of drugs, which attributes to them elective affinities for certain tissues in preference to others, have still their advocates, is shown by the following extracts from a lecture recently delivered at the Middlesex hospital.<sup>2</sup> "In experimenting on the effect of drugs, our great object must be to *localise* their action—to be able to say with certainty: this is the organ on which this medicine acts, and such and such is the action which it exerts upon it.

\* \* \* We might take a highly organised animal, \* \* \*

<sup>1</sup> Among which are included Alcohol, Ether, Chloroform, Opium, &c.

<sup>2</sup> 'Lectures on the Experimental Investigation of the Action of Medicines,' by T. L. Brunton, M.D., D.Sc., &c.

and, by operative procedures, allow the medicine to act now on one and now on another part of the body, \* \* \* till we find out those parts for which it has a particular affinity." We shall see, however, by reference to the views of other writers on the subject, that the question is widening, and that to understand it, in all its bearings, it will be convenient to discard the older doctrine, which seemed to apply with peculiar force to that class of substances termed stimulants, sedatives, and narcoties, assuming, as it did, that they owed their activity to an elective affinity possessed by them for the nervous tissue, more especially that part of it on the functional integrity of which consciousness depends.

In the following attempt to advocate another theory in explanation of the manner in which anæsthetics act, it will simplify the argument, if, in the first instance, we make no distinction between anæsthetics and other substances which exert a destructive power on the animal organism. Regarding them, then, as poisons, we can begin by treating the subject on its widest basis.

Aqueous solutions of the extracts of Hemlock, Belladonna and Opium, Strychnia, Prussic Acid, and Arsemaous Acid, substances so obnoxious to the animal organism, exert a poisonous influence on vegetable life (Pereira's '*Materia Medica*').

It will not be denied, I think, by those who have studied the actions of poisons, that they produce the same general effects on the lower animals as on man: keeping in view these general facts, it would surely seem more rational to believe, unless there be positive proof to the contrary, that any drug or substance having a deleterious action on any single organic tissue, must exercise a like action on every other similarly constituted tissue; the degree of energy with which it seems to act being measured by the functional activity and nutritive supply of any organ or structure. The most highly organised structures of necessity first indicating the presence of any noxious agent.

To show into what hopeless confusion the "elective affinity" doctrine leads us, I will quote a few of the theories professing to explain the cause of death in poisoning by Strychnia. M. M. Claude Bernard and Stannius are of opinion that "Strychnia causes death by its action on the sensory nerves,"



(quoted by Dr. Fraser in his paper on the 'Physiological Action of the Calabar Bean'). Heineman holds that when introduced into the circulation, Strychnia seems to exercise a depressing influence on the motor ganglia of the heart, causing it to stop in diastole (quoted in 'Carpenter's Physiology'). Dr. Brown-Séquard supposes that the action of Strychnia consists in an increase of nutrition of the nervous centres, by which excess of nutrition, the reflex faculty becomes much increased, (quoted by Dr. G. Harley, 'Lectures on Physiological Action of Strychnia'). Stilling, Valentin, Budge, Volkman, Arnold, and Ludwig appear to take for granted the doctrine of the direct action of Strychnia on the spinal marrow, (Dr. G. Harley's Lectures, &c.) Dr. G. Harley's own experiments and observations led him to conclude "that Strychnia acts by destroying the power of the tissues and fluids of the body, to absorb oxygen and exhale carbonic acid." That the toxic action of Strychnia is not confined to the sensory nerves or the spinal cord, seems to be proved by the following experiment recorded by Dr. G. Harley. "If the hearts of two frogs be removed from the body, and one placed in pure distilled water, the other in a solution of the acetate of Strychnia, the former will pulsate regularly for more than an hour; the latter will cease to beat in from one to five minutes according to the strength of the solution of the poison. Rigor mortis speedily supervenes." This speedy disappearance of the signs of vitality from the muscular tissue proves that other, as well as the nervous tissues, are implicated.

It is well known that muscular tremors are common in poisoning by many substances. Dr. Fraser's experiments with the Calabar Bean showed that these tremors always came on in the course of its action, and he adduces the following in proof that the muscular substance itself was involved in the toxic process. "I frequently removed a muscle from the dead body of an animal poisoned by the Calabar Bean, and found that these twitches still continued and in one instance rapidly followed each other in separate parts of its substance. I believe the effect is due to the contact of the poison with the muscular substance itself." Magendie states that the muscular irritability is rapidly lost in animals killed by prussic acid. Many other facts might

be quoted to show that all the tissues and organs are implicated in the poisoning process, and that it is because the perfect functional activities of some are less indispensable to the maintenance of life than those of others, that we fail to notice this participation.

In returning to the consideration of the general question, I would again refer to Dr. G. Harley's experiments and observations, which tend, in his opinion, to show that not only Strychnia acts by destroying the power of the tissues and fluids, to absorb oxygen and exhale carbonic acid, but that many other poisons exert their influence in a similar way, "for I have found," he writes, "that hydrocyanic acid, chloroform, nicotine, alcohol, ether, morphia, and several other narcotics have the same power."

From the following passage in M. M. Kussmaul and Tenner's work on 'Convulsions,' it may I think be inferred that they, expressing it in more general terms, were inclined to adopt the same view. In drawing attention to the remarkable resemblance which exists between the symptoms following copious and sudden hemorrhage, and those from large and rapidly fatal doses of most poisons they ask "Whether in these cases the cause of the sudden appearance of unconsciousness, insensibility, as well as of general clonico-tetanic convulsions, in which the pupils are contracted and then dilated, is not to be mainly sought in the suddenly interrupted nutrition of the brain?"

In his introduction to Dr. Snow's work on 'Anæsthetics,' Dr. Richardson writes, "From 1848 to 1851, Dr. Snow contributed a series of experimental papers on Narcotic Vapours, in the 'Medical Gazette.' His greatest deduction on these matters and the proofs on which it is based, are to be found in his observations, where he explains that the action of the volatile narcotics is that of arresting or limiting those combinations between the oxygen of the arterial blood and the tissues of the body, which are essential to sensation, volition, and all the animal functions. He demonstrated that these substances modify, and in large quantities, arrest the animal functions in the same way and by the same power as that by which they modify and arrest combustion, the slow oxidation of phosphorus and other kinds of oxidation unconnected with the living body, when they (the

narcotics) are mixed with the atmospheric air. \* \* \* Placing a taper during one of our experiments in a bottle, through which chloroform vapour was diffused, and watching the declining flame he said, 'There now is all that occurs in narcotism.'

\* \* \* I could illustrate all the meaning of this great practical discovery of narcotism on a farthing candle, but I fear the experiment would be thought rather too common-place."

In his 'Remarks on the Physiology of Anæsthesia,' (read at the meeting of the British Medical Association, at Oxford, 1868,) Dr. G. Johnson adopts this explanation of the action of anæsthetics, and, after referring to Dr. Snow's and Dr. Harley's researches, adds, "In confirmation of this view that narcotics lessen oxidation, I would refer to the well known fact that opium checks the secretion of bile, so that as a result of its administration we often get clay-coloured stools. This is intelligible if we bear in mind that bile is a product of oxidation, and that opium lessens oxidation." It is scarcely necessary to allude to the experiments showing that anæsthetics cause a reduction of temperature in any animal to which they are administered.

From a consideration of these facts it would appear that in their general mode of operation no essential difference exists between anæsthetics and other poisons, and that we must seek another explanation of the diversity in symptoms produced by different drugs, than that misleading one, which, seizing on the most prominent symptoms, would attribute all the ultimate effects to an affection of that organ, whose implication would seem to be more especially indicated by the nature of the symptoms. "In the eyes of the physiologist and medical philosopher," says M. Claude Bernard in his 'Lectures on Experimental Pathology'<sup>1</sup> "the effects of poisons are, as we have recently proved, exactly similar to those of disease." Any general theory, then, professing to explain the manner in which poisons act, must bear the test of the very widest applicability, and must, in short, be reconcilable with all the morbid phenomena of life. Instead, however, of attempting the impossible task of controverting the many objections which start up on every side to a doctrine so little in harmony with all the traditions of medicine, I will confine myself to

<sup>1</sup> 'Medical Times,' 1860.

a discussion of two essentially antagonistic theories, to which we have long clung with fond tenacity: they are those of counteragency and stimulation.

Touching the question of Counteragency, Dr. Fraser, whose researches on the actions of poisons are so widely known, writes, "To argue from pupil effects alone, to an antagonism between the action of Morphia and Atropia, I believe to be absurd. \* \* \* We shall never have antidotes to active substances, until we can produce within the body chemical changes in their composition of such a nature as shall render them inert." Dr. J. Harley, too, on his work on the 'Old Vegetable Neurotics,' after remarking that the question of the antagonism of opium and belladonna has become a very important one, and, after having thoroughly sifted the evidence in favour of this theory, and added the testimony of his own experiments, concludes, "1. That the evidence of antagonism in any given case is inconclusive. 2. Taken individually or collectively, the cases show that belladonna has no influence whatever in accelerating the recovery from the poisonous effects of opium. 3. That somnolency, stupor, narcotism, and coma, the essential effects of the action of opium, are all intensified and prolonged by the concurrent action of belladonna.

In reference to the supposed power of chloroform to counteract the effects of strychnine, Dr. Anstie says, that his observations and experiments led him to form the opinion that "chloroform has no direct antidotal action to strychnine."<sup>1</sup>

Having such testimony as this to warrant us, I think we may safely abandon the doctrine of counteragency in any other sense than where chemical or mechanical agencies can be brought into direct operation.

The question of stimulation is a much wider one and involves much more important issues. In endeavouring to explain the symptoms, which in a peculiar manner distinguish stimulants and anæsthetics, that is, such substances as alcohol, ether, chloroform, nitrous oxide, &c., it will be necessary to bear in mind the structure of nerve tissue: the vesicular portion being far more vascular than the fibrous, and, as Mr. Herbert Spencer points out, "while the matter of nerve-vesicle is so arranged as

<sup>1</sup> 'Stimulants and Narcotics.'



to offer the least possible obstacle to the reception of fluid from the adjacent capillaries, the matter of nerve-fibres is shielded by a medullary sheath. Hence when any agent, capable of so changing the molecular state of nerve-matter as to arrest its function, is carried into the blood, it first acts on the nerve corpuscles."<sup>1</sup> Further on when treating of the symptoms of stimulation and narcotism, we shall see the practical inferences to be drawn from these peculiarities of structure.

Recent observation and research have done much to prove the fallacies on which the old views of stimulation were based, and to show that a strong incompressible pulse, flushed skin, irritability of the muscular system, as indicated by spasm and convulsions, are no evidences of increased vital power, but rather the contrary.

Dr. Radcliffe, in his work on 'Epilepsy,' draws attention to the fact that "increased disposition to ordinary muscular contraction appears to be associated with diminished supply of blood to the muscular system," and points out that, though the circulation is less active in fishes and reptiles than in birds and mammals, yet the muscular system is more irritable in the former than in the latter—that the circulation is less active in the involuntary muscular system of an animal, than in the voluntary, and irritability is more marked in the former than in the latter. The condition of hybernating animals affords, he says, another illustration in point.

Referring to the fact that when vital influences have ceased to operate on muscular substance it passes into a state of contraction, because then comes into operation the attractive force inherent in its molecular constitution,—Dr. Radcliffe expresses the opinion "that it is not at all improbable that in the rhythmical action of the heart the systole of the ventricles may exhibit on a small scale, and naturally, what is exhibited on a large scale, and artificially, in the experiments of Sir A. Cooper and M. M. Kussmaul and Tenner: that the stoppage of the supply of blood to the rhythmic nerve centres, which takes place when the ventricles pass into the state of diastole, may bring about the state of systole in the ventricles in the same way as that in which general convulsions is brought

<sup>1</sup> 'Principles of Psychology.'



about by shutting off the supply of blood to certain nerve centres within the head."

As to the value of the strong incompressible pulse as an indication of exalted vital power, it is only necessary to recall the fact that this condition of the circulation is found whenever there is an obstacle to the flow of blood in any part of the system: it is presented in its most marked form perhaps in an animal undergoing strangulation. It is also seen in certain stages of the inflammatory process: in Bright's disease, and in General Paralysis of the Insane.

Flushing of the skin occurs when the interference with the free passage of the blood in the capillaries is less in degree. Any change in the constitution of the blood lessening its power of absorbing oxygen, must, *pro tanto*, diminish the facility with which it flows through the capillaries.

On what grounds do we still adhere to the belief that true stimulation is possible?

In the most recent systematic work on Stimulation, the views of the author are very definitely and concisely set forth: the "Genuine effects of stimulation are," Dr. Anstie writes,<sup>1</sup> "1. Relief of pain. 2. Removal of muscular spasm, tremor, or convulsions. 3. Reduction of undue frequency of the circulation. 4. Reduction of excessive secretion. 5. Removal of general debility, or of special fatigue of muscles, brain, or digestive organs. 6. Removal of delirium, and production of healthy sleep. 7. Support of the organism in the absence of ordinary food. 8. Local increase of nutrition where this is deficient."

No direct mention is here made of the subjective feelings of exhilaration, which form so conspicuous a part of ordinary stimulation; and which doubtless more than any other suggested the existence of a true exaltation of the vital powers.

So closely do the effects of true stimulants resemble those following the ingestion of easily assimilated food that Dr. Anstie, after citing those produced by alcohol, opium, and tobacco, says, "these instances appear to me inexplicable except that they depend on a kind of food-stimulant effect," and a little further on, in the course of the argument, occurs the passage, "it is difficult to avoid the conclusion that the word 'food' requires

<sup>1</sup> 'Stimulants and Narcotics.'

to have a more extended significance accorded to it than is usually given."

Are the facts really such as to warrant an hypothesis like this? And are we compelled for want of a better explanation to admit that we are daily experimenting with substances which in small quantities are food, and in a little larger, the most deadly poison? I venture to think not, but that a true interpretation of all the phenomena will show that these so called stimulants act with the same uniformity when brought into contact with the fluids and tissues of the body, as an acid does in the presence of an alkali; and that the stimulants, sedatives, or whatever name we choose to give them, as well in small as in large doses; in the earlier no less than in the later stages of their operation, disable the powers of life by—in the words of Dr. Harley—"destroying the power of the tissues and fluids of the body to absorb oxygen and exhale carbonic acid," and that there is no such thing as stimulation as the term is generally understood.

Assuming this to be a correct view of the manner in which stimulants and narcotics act, and accepting it without qualification of any kind, we see at a glance how it implies that the first sign of the action of one of these substances would be manifested by a lowering of the true vital activity of the vesicular nerve-tissue, because it is the most vascular, and, therefore, the most unstable of all the tissues. In the case of nerve-substance, Dr. Carpenter writes,<sup>1</sup> "its existence as living structure appears to be terminable at any time by the exercise of its functional powers: for the development of nervous force seems to involve, as its necessary condition, a metamorphosis (so to speak) of the vital power which was previously exercising itself in the nutritive operations; and the materials of these tissues, now reduced to the condition of dead matter, undergo those regressive changes which speedily convert them into excrementitious products. But the very manifestation of their peculiar vital endowments determines an afflux of blood towards the part thus called into special activity, \* \* \* the nutrition of the textures is thus promoted, \* \* \* a due supply of the requisite materials being always presupposed."

<sup>1</sup> 'Human Physiology.'

From the teachings of Anatomy and Physiology we should infer, *a priori*, that those parts of the nervous tissue, which are in an eminent degree every moment undergoing this metamorphosis, would be the first to become enfeebled when the supply of oxygen is diminished; practical experience would seem to confirm this inference. M. Flourens made the following remarks respecting the action of ether, and they apply equally well to the effects of chloroform when it is inhaled gradually. "Under the action of Ether the nervous centres lose their powers in regular succession—first, the cerebral lobes lose theirs, viz., the intellect; next, the cerebellum; thirdly, the spinal marrow; fourthly, the medulla oblongata, with loss of power in which life is lost," (quoted by Dr. Snow in his work on 'Anæsthetics').

There is no controversy as to the truly paralysing nature of the action of these substances when their influence has extended to the lower centres of co-ordination; the difficulty lies in showing that the loss of the sense of fatigue, of apprehensiveness of that irritability which favours the continuance of convulsions, tremors, and spasm, and in short of the whole train of symptoms enumerated by Dr. Anstie as those of "genuine stimulation," are to be explained also as being but the earliest symptoms of the same paralysing process.

We have seen that there exists a general relation between the supply of Oxygen to the blood and the functional activity of the nervous centres; but if the hypothesis advanced be true, that is, if the rate of oxygenation of the blood be lowered when stimulants are administered, how account for the display of nervous activity usually witnessed during their operation, as evidenced by the vivid flow of ideas, recurrence of images, fancies, and the memory of events, which were supposed to have been long ago obliterated from the mind. I think they can be consistently accounted for; but before directly attempting the explanation, let me draw attention to a few other nervous phenomena which occur independently of the administration of intoxicating substances.

It is a matter of common observation, that when the nerve-centres fail to receive their due nourishment, whether from temporary fatigue or any other cause, *if demands are still made on their activity*, they manifest an usual degree of irritability.

Familiar illustrations are afforded in the sleepy crying child, in those enfeebled by disease, and in the hysterical woman. In cases where the controlling influence of the higher nerve-centres has been abolished by disease or injury, it is frequently observed that response to a stimulus applied to a part beyond the seat of lesion is much more rapid and violent than when functional integrity is preserved.

In his work on the 'Epidemics of the Middle Ages,' Dr. Hecker points out how those extraordinary outbursts of frenzied excitement—the dancing manias—were always preceded by seasons of unusual misery and privation. "Throughout Asia and Europe the atmosphere was in commotion, and endangered by its baneful influence both vegetable and animal life. \* \* \* The order of the seasons seemed to be inverted—rains, floods, and failures in the crops were so general that few places were exempt from them. \* \* \* Want, misery, and despair were general throughout Christendom. \* \* \* Men's minds were everywhere morbidly sensitive." Such was the general condition of things when the first outbreak of the Dancing Mania occurred, and it only required the powerful incentives of suggestion and sympathy to move the weaker and more susceptible individuals of a community subjected to such influences, to those extravagant manifestations of delirious excitement, known as St. John's and St. Vitus's Dance, and Tarantism. Describing the epidemic of Tarantism, Dr. Hecker writes, "All who were affected became insensible to ordinary causes of excitement, nothing but music afforded them any relief. On hearing it, they were roused as if by enchantment; joining in the dance. As the strains grew quicker they gradually hurried into the most passionate dance. \* \* \* It was generally observed that country people, who were rude and ignorant of music, evinced on these occasions an unusual degree of grace, as if they had been well practised in elegant movements of the body." In describing another epidemic, the passage occurs, "Those patients who did not lose their consciousness from the excitement were in general made more furious by every attempt to quiet them by force."

Illustrations of this condition, where the controlling influence of the higher nervous centres having been temporarily



abolished peculiar forms of excitement are manifested, are afforded by the phenomena of hypnotism. Whatever estimate one feels disposed to form of Mr. Braid's theories, implicit trust may be placed in anything he relates as matter of fact. He describes on one occasion how he took thirty-two children into a room:—"I made them stand up at three times, and in ten or twelve minutes had the whole thirty-two hypnotised, maintaining their arms extended while in the hypnotic condition, and this at mid-day." His most striking and successful cases were those in which he hypnotised young women. He narrates the following as "one of the most beautiful and decided examples of the effects of hypnotism," which is indeed a striking illustration of how, when the power of attention of the mind is circumscribed and certain faculties are incited to activity, they manifest the activity in a peculiarly exaggerated manner:—Miss S——, one of three very intelligent young ladies, who had been introduced to Mr. Braid on the same day, and who knew nothing of hypnotism or phrenology, *but who had witnessed the effects on two other individuals before being operated on*, "sat down an entire sceptic; but in a few minutes she was not only most decidedly hypnotised, but also one of the most beautiful and decided examples which could possibly have been met with of the phrenological sway during hypnotism. The moment 'veneration' was touched her features assumed the peculiar expression of that feeling; the hands were clasped, she sank on her knees in the attitude of the most devout adoration; combined with 'hope,' the features were illuminated, and beamed with a feeling of ecstasy, and when 'ideality' was added the ecstasy was so extreme as scarcely to be supportable. \* \* \* A waltz being played, she danced with a grace and elegance surpassing all which any of us ever witnessed."

Mr. Braid describes cases in which those hypnotised were able to sing quite correctly any common tune suggested, whereas they had never been able to sing in tune before being placed in this state. Among the physical symptoms described by Mr. Braid as accompanying the hypnotised state are the following:—"The pulse and respiration are at first slower than is natural, but immediately on calling muscles into action, a tendency to cataleptiform rigidity is assumed, with rapid pulse, and oppressed, quick



breathing. \* \* \* The rise in pulse from mere muscular effort, to enable patients to keep their legs and arms extended for five minutes, is about 20 per cent. : when in the state of hypnotism it is upwards of 100 per cent. At an early stage of the hypnotising process the pupils became widely dilated."

It would seem that we have here proof that the temporary diminution of the activity of a portion of the mental faculties is preceded by a deficient supply of oxygen to the nerve-substance.

Let us now compare the phenomena we have seen to result from bodily exhaustion or mental fatigue, when the enfeebled nervous centres continue to be stimulated to activity, with those following the administration of anæsthetics and stimulants.

The rapidity with which Nitrous Oxide is exhaled, permitting a correspondingly rapid resumption of the cerebral functions, renders it of great value as a means of estimating correctly the signs of its operation either in small stimulating, or in large anæsthetic doses. I have not tried the effects of the dilute Nitrous Oxide on children: but when it is inhaled by the feeble-minded and demented, if they can be induced to breathe it without apprehension, it has a uniformly sedative effect—no signs of excitement occurring unless as a result of efforts made to arouse them to activity. Inhaled by the melancholic, it seems invariably, unless other trains of thought are suggested, to cause, as its immediate effect, exaggerated expression of their miserable feelings; and they moan and cry in a most piteous manner.

Administered to those who labour under delusions of a religious character, the prominent feelings displayed are those in which the religious element predominates. The constant effect of its inhalation on those of sound mind is to bring into prominence the habitual manifestations of mental or bodily activity, should there be no disturbing influences at work. If the subject of the experiment be of a lethargic disposition, or be persuaded that he will go to sleep without passing through a stage of excitement, he generally does, in fact, quietly fall under its influence, and, when roused, remembers nothing further than that he has been asleep. One of my friends who had experienced most agreeable feelings on first taking it, on inhaling it a second time, after an interval of several months, fell

into a state of such extravagant hilarity that he shouted with great vehemence, "I never knew what Paradise was before," repeating the same exclamation until the stage of excitement had passed off. Sir Humphrey Davy remarks, in his 'Researches on Nitrous Oxide,' "The muscular actions produced by Nitrous Oxide seemed to depend upon the peculiar habits of the individual: they were mixed automatic motions."

Having, in a former paper, detailed the effects of the dilute Nitrous Oxide on myself, I need only add that every additional experiment only serves to convince me that at a certain stage of its operation the mind is extremely susceptible to suggestion, and, until narcotised, responds to any stimulus with gradually increasing energy and force, showing a tendency to pursue the same trains of thought, until a new stimulus is applied of sufficient strength to divert the remaining unparalysed mental faculties into another channel of activity, but that, on the other hand, if, during the inhalation, all incentives to excitement are removed, the effects are simply of a sedative character.<sup>1</sup>

The general resemblance between the symptoms just described and those caused by the inhalation of Chloroform, will be seen by reference to the following descriptions of its mode of action in Dr. Snow's work on 'Anæsthetics.' "Children come quickly and easily under the influence of Chloroform. \* \* \* Usually the more feeble a patient is, whether from illness or any other cause, the more quietly does he become insensible. \* \* \* Hysterical females very readily yield up their consciousness when inhaling Chloroform. \* \* \* It is in strong men, accustomed to hard work or athletic sports, that rigidity and struggling most frequently occur. I think the patient, in whom these symptoms were most violent, was a celebrated harlequin of one of the London theatres, on whom Mr. Fergusson operated. \* \* \* Those persons whose mental faculties are most cultivated appear usually to retain their consciousness longest whilst inhaling Chloroform."

<sup>1</sup> As illustrating the accidental nature of exaggerated activities, when the vitality of the nervous system is depressed, I would draw attention to the following fact:—"It has been found that frogs, after fatal doses of Strychnia, may die *without any convulsions*, if care be taken to protect them from all causes of excitation." Marshall Hall, &c. (Quoted by Dr. Fraser on the 'Calabar Bean.')

Bearing in mind the conditions in which they are observed, the consideration of all these phenomena, viz., general exhilaration, rapid flow of ideas, and exaggeration of feelings and emotions, surely warrants the inference that the interpretation which takes them for tokens of true exaltation of the vital forces, is an erroneous one. It would rather seem that they are all in a great measure accidental—and are a result of the concurrence of a stimulus to activity with an enfeebled nervous system.

Do the facts of physiology afford any assistance in our endeavours to make them plain?

I have before quoted from Dr. Carpenter's 'Physiology' to the effect "that development of nervous force seems to involve, as its necessary condition, a metamorphosis of tissue," but that so long as there is a due supply of nutrient materials furnished by the blood, their continued healthy exercise is possible.

When these reparative materials fail to be supplied in sufficient quantity, a sense of fatigue quickly follows, with a disposition to sleep. If this call for repose is complied with, the balance of supply and demand is preserved, and quiescence maintained: if, on the contrary, stimuli to activity continue to be presented to the nervous centres, what must follow? Of necessity, an unduly rapid metamorphosis of the nerve-substance—the symptoms accompanying which are seen in their extreme manifestation, in the delirium from impoverished blood, and also in a slighter, and hence less easily recognised form in the disordered current of thought proceeding from "stimulation" by Alcohol, Nitrous Oxide, &c.

It is now held by many that memory depends on organic growth of cerebral matter, and that the primary forms of co-ordinated movements depend on memory. When the vitality of the nervous tissues is lowered, the centres associated with these primary automatic movements are among the last to become paralysed, and, in an ascending series, the least recently organised co-ordinations yield in their turn to the devitalising influences. "The plexuses," writes Mr. Herbert Spencer, "which, by connecting and co-ordinating a variety of inferior plexuses, adapt the behaviour to a variety of external requirements, have been but recently evolved; so that besides being extensive and intricate, they are formed of much less permeable

channels. Hence when the nervous system is not fully charged these latest and highest structures are the first to fail.”<sup>1</sup> New co-ordinations of thought are being effected every moment of consciousness, and are effected with a precision and comprehensiveness proportioned to the healthy activity of the cerebral matter. Should, however, the nutritive properties of the blood be diminished, the power to effect these highest co-ordinations will be first enfeebled, and they will, in truth, be the first to indicate the changed quality of the blood. Is the administration of stimulants followed by any such indications? It would seem so, from the fact that no sooner have they begun to operate than the grasp of the mind on the thought-processes, suggested by surrounding circumstances, is enfeebled—an exact estimate of these circumstances is no longer formed—certain qualifying incidents being lost sight of by the already implicated nerve-centres. Of this condition we have a good illustration in the early stages of Chloroform inhalation. Describing the effect upon the intellectual operations, which, however, he seems to think is “an invigorating one,” Dr. Anstie says of a patient about to *undergo a surgical operation*, “During the first few seconds of inhalation, \* \* \* needless timidity and distress vanish, while consciousness is as yet unaffected, and the expression of the face is bright and intelligent.”

There are qualifying conditions of body and mind with respect to the actions of stimulants which require to be explained; they are the cases where fatigue, pain, tremors, or convulsions are present. Dr. Radcliffe, and indeed all recent writers on the subject, hold that pain, tremors, and convulsions are connected with a lowering of the vital power, and that the condition of the circulation, where these symptoms are present, confirms such a view. Depress the vitality still further by the administration of a *stimulant*, and what follows? The exhausted and suffering nerve-centres, though they may continue to act automatically, lose the sense of suffering, because the nerve-tissues, on which the memory of fatigue and pain depend, are paralysed.

Take the case of one suffering from Delirium Tremens, or, better still, of one suffering from the misery, depression, and tremors brought on by habitual alcoholic excesses—we know

<sup>1</sup> ‘Principles of Psychology.’



that in the latter case the blood always contains a large quantity of alcohol; when, however, a certain portion of it has been excreted, and the higher nerve-centres are undergoing the process of recovery, the general sense of misery becomes insupportable, and the only means of obtaining immediate relief is, by taking more alcohol, to again narcotise the suffering tissues, when, as if by enchantment, the pain, depression, and tremors cease, so that many have claimed such effects as proving that stimulants have the power of truly exalting the vital forces.

When convulsions are present, the nutrition of the nerve-centres is deficient. Clinical observation has long since taught us how great is the tendency to persistence in any spasmodic, tremulous, or convulsive movements once initiated in a greatly debilitated patient,<sup>1</sup> and, when a tolerably long interval of rest has been obtained, how hopeful are the prospects of their complete cessation.<sup>2</sup> The treatment of infantile convulsions, by small doses of alcohol is now generally admitted to be the most successful yet discovered. It need not be mentioned how extremely susceptible children are to the action of narcotic medicines, and I think we may venture to assume that the beneficial action of alcohol, in these cases, is owing to its destroying the remaining irritability of the suffering and nearly exhausted nerve-centres, and thus procuring rest.

Thus the essential action of alcohol and other supposed stimulants, in whatever dose administered, would seem to consist in a lowering of the vital activities; and their beneficial effects, when employed medicinally, do not contradict this theory.

<sup>1</sup> In the course of the experiments with the rabbits, it was seen that at a certain stage of the anæsthetic process, when a strong stimulus was applied to a limb—as severe pinching—the animal withdrew the part in a convulsive manner, and that convulsive twitching of the same limb (in some cases extending over the whole body) continued for a time without any repetition of the stimulus. So in those cases where, at a corresponding stage, the animal began to utter cries, they were, without renewal of the cause, persisted in for several seconds.

<sup>2</sup> The most speedy recovery I ever saw from chorea was one in which, from the severity of the symptoms and the complete absence of any kind of control over the limbs, it was thought advisable to employ packing in a wet sheet—this treatment was carried out, and, from some misunderstanding, the child was allowed to remain with all her limbs thus confined for more than forty-eight hours. When the sheet was removed all traces of the choreic movements had permanently disappeared.



# CRANIAL INJURIES AND MENTAL DISEASES.

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## VARIATIONS IN THE MENTAL EFFECTS OF CRANIAL INJURIES DUE TO THEIR LOCALIZATION.

Grave and numerous difficulties present themselves when any attempt is made to trace a connection between the mental effects of cranial injuries and their local position. The immediate diffusion of any external force which impinges upon the elastic parietes of the head, the combination of general concussion with almost all limited breaches of continuity in the brain, or its membranes, the non-correspondence of the internal lesion, with the external point of impact of violence, which is so often found when the head has sustained an accident, the inability of the sufferer, in many cases of serious cerebral mischief, to furnish trustworthy information, respecting his own experiences, and, above all, the ignorance which we must still confess as to the physiological uses and relations of the various encephalic centres, involve this subject in doubt and perplexity. And perhaps one other circumstance contributes as much as any of the above to the uncertainty which surrounds the mental effects of local cranial injuries, and that is, that really accurate observation has scarcely yet been brought to bear upon them. It is to be remembered that injuries of the head almost invariably fall

under the care of surgeons, and are reported for surgical purposes, and not with any view to psychological or medical inquiry; hence the state of the mind is only mentioned incidentally, in the vaguest terms and sometimes in the most incorrect way. If the patient is free from delirium, and can say "Good morning," and put out his tongue when told to do so, it is recorded that 'his mental faculties remained entire,' that 'there was no deficiency of intellect,' or that he 'was clear and collected to the last.' This testimony, of course, to be of any value necessarily supposes a skillful and exhaustive exploration of the mind in all its departments, and a scrupulous attention to minute and intricate details in each particular case. Being founded, however, only upon the most superficial examination, it is not merely valueless but mischievous and misleading. To evidence of this kind must, I believe, be traced many fallacies which have impeded scientific progress, such as the statement that a whole hemisphere of the brain may be destroyed without the mind suffering in any way, or that every part of the brain has been found disorganised in one case or another, without any derangement of the mind having existed. More exact clinical histories would have prevented the dissemination of such baseless assertions, and would have removed many obstacles which still oppose our approach to a satisfactory knowledge of the consequences of blows or wounds on the head.

Recent advances in anatomy and physiology, and especially the morphological studies of the last few years, respecting the cerebral convolutions, seem to confer a new importance upon the observation of any mental deviations, immediate or remote, arising out of local brain injuries. We now know that the brain is not a mass of confused puckerings, but a classified organ, with definite plications, which can always be recognised and named. We know further that these plications and gyri, which are tolerably symmetrical in the two hemispheres, and which are developed in a definite order, differ from each other in their intimate structure and arrangement, and we have thus suggested to us the view that they are physiologically distinct organs, and that their various constitution corresponds with various functions. We are thus conducted back by a new route

to the old phrenological doctrine, or some modification of it, that certain groups or faculties into which the psychical activities are specialized, are carried on in special portions of the cerebrum. It is made probable that there are thought territories as well as cell territories, and that these merge into each other, and exert reciprocal influences. For the confirmation or refutation of this suggestion, it is most desirable that we should have precise records of the mental symptoms, observed in cases in which one or a few convolutions have suffered injury. The seat of an injury or morbid product can now be specified, with an exactitude formerly unknown, and trustworthy histories are therefore alone wanting to render practicable an inquiry, the importance of which cannot well be exaggerated.

At present, even in the absence of any such elaborate investigation, we are not without some little information, as to the consequences of lesions of certain portions of the brain, and, as to the danger to life and reason, of violence applied to certain aspects of the cranium. Mr. Guthrie taught, as the result of his large experience, that violence on the front part of the head is more dangerous in every way than the same amount of violence applied to the middle region, and that a fracture of the skull and lodgment of a foreign body, or of a splinter of bone in the brain, may sometimes take place in the back part without permanent detriment. The records of this asylum, only partially bear out Mr. Guthrie's generalizations. They tend to show, roughly, that injury of the forehead is exceedingly perilous, that injury of the side of the head is less so, but that injury of the back of the head is quite as hazardous as that of the forehead. They tend also to corroborate the statements of surgeons, as to the importance of considering the exact position of the *contre-coup*, in estimating the consequences of cranial injuries. A large number of cases, which have past under treatment here, have shown signs of damage having been effected at a point exactly opposite the part struck. Thus in four patients, during the past six years, treated in the West Riding Asylum, severe epilepsy with dementia has been noticed as the consequence of a fracture, with depression of the skull or violent blow at the upper part of the frontal bone, at a point as nearly as possible opposite to the medulla oblongata.

M. H., ætat. 19, from Skipton, was perfectly intelligent and healthy until nine years of age. At that time, for some school offence, she was struck on the side of the head by a pupil teacher with such force as to knock her down. In falling she caught the upper part of her forehead, on the left side, against the projecting corner of a desk, causing no external wound, but a visible depression. She was not immediately unconscious, and, in fact, no great change in her was noticed until the evening, when she had a fit, followed by temporary loss of power on the right side. After that, epileptic fits, from which no other member of her family had ever suffered, recurred frequently. She was placed in the Hospital for Epilepsy and Paralysis, in London, under the care of Dr. Russell Reynolds, who pronounced her state hopeless, and, ultimately, when nineteen years of age, she was sent to this Asylum on September 3rd, 1866. At that time she was found to be very fatuous, scarcely understanding what was said to her and being dirty and degraded in her habits, and slow and clumsy in all her movements. Her bodily health was much reduced. She was extremely pale and anæmic. The left side of the face, that corresponding with the injury, was decidedly less in all its dimensions than the right side. The pupils were equal, the tongue bore marks of biting on both sides, and the muscles were soft and flaccid. During her residence in the West Riding Asylum, she suffered from severe fits affecting both sides of the body, preceded by a scream, and occurring in groups of about three or four, once a week. Before these fits she was restless and combative, and after them she was in a semi-comatose state. Her health gradually failed, tubercle was deposited first in the right lung and then in the left, and she died on the 12th June, 1871, after a succession of fits. At the autopsy which took place, thirty-five hours after death, the body was found fairly nourished, the skin being remarkably pale and fine. Several minute pin-head ecchymoses like flea-bites, were seen scattered over the chest. Rigor mortis was absent in the arms but present in the legs. The skull was found to be symmetrical, of average thickness, and of pale colour. At the junction of the parietal with the frontal bone, and immediately to the left of the mesial line, there was a depression an inch and a half in length and half an inch in breadth, parallel in direction with the sagittal suture. The hollow seemed to be at the expense of the diploic structure of the bone, as no corresponding depression could be detected on the inner surface of the skull. There was no trace of fracture, and no adhesion of the scalp or dura-mater to the skull. The arachnoid was perfectly transparent, but the superficial veins were distended with dark blood, and the pia-mater was injected. There was some wasting of the postero-parietal lobule on both sides. The convolutions of the right frontal lobe were plumper than those on the left side, which were somewhat flattened. The grey matter was of good thickness, and paler in its outer than in its deeper layers. The white matter had a dusky hue, and presented numerous blood-points. There were dilated varicose looking vessels on the floor of the fourth ventricle. The upper lobes of both lungs contained cavities and masses of cheesy tubercle, which also filled the bronchial glands. All the other organs were healthy, the uterus, however, being unusually small.



Another case, in which a fracture of the frontal bone was followed by epilepsy, and which is thought worthy of notice, was that of:

T. N., admitted to the West Riding Asylum on the 27th of December, 1865. He was then thirty years of age, and was stated to have been epileptic since he was nine years old. Being then employed in a coal pit, he was crushed by some falling coal, and sustained a compound comminuted fracture of the frontal bone on the right side, from which several fragments were removed, and from which some cerebral matter escaped. When the skin closed over this wound, there remained an osseous deficiency of somewhat the shape of a cocked hat, extending obliquely across the upper part of the right frontal bone, from the inner extremity of the orbital prominence, upwards, outwards and backwards. The length of this deficiency at its base was two inches, and its greatest breadth at its centre was one inch and an eighth. The cicatrix presented a white, glistening appearance, and pulsated visibly. There was also fracture and displacement downwards of the roof of the orbit, causing great prominence and divergent strabismus of the right eye. At the time that this injury was sustained a number of epileptic fits occurred, and these continued afterwards to recur from time to time, not, however, preventing the patient from working for ten or twelve years. Ultimately, however, his mind became so weak that he could not be trusted to look after himself. Subsequently to the injury he had been always a little childish. When received into the Asylum he was much demented, and laboured under epileptic seizures of great severity, convulsing both sides of the body. The deficiency in his skull afforded an opportunity of watching certain conditions and changes in the brain, which, as the result of many observations, I may summarise as follows.—

When T. N. is asleep, or sitting in a quiet stupid state, as he frequently does, the centre of the cicatrix is in its most depressed condition, being three-eighths of an inch below the level of the frontal bone, and only the slightest degree of pulsation, synchronous with the radial pulse, is then perceptible in it.

When he is awake, or roused from his stupid state, and made to answer questions, a greater fulness and increased pulsation are at once seen in the cicatrix. When he is engaged in conversation for some time, and especially on a subject in which he is interested, such as recollections of the pit, the fulness and pulsation become much more apparent.

When he is in the recumbent position, being awake, pulsation is more obvious than when he is sitting or standing.

When the head is thrown backwards, the cicatrix comes nearly to the level of the frontal bone, and the pulsations grow very violent.

When the head is bent forwards, the cicatrix becomes swollen out, until it is level with the skin of the forehead, and all pulsation ceases.

When the head is bent either to the right or to the left, a slight increase of pulsation is evident, but no change in the depth of the cicatrix is perceptible.

When he has been running, the pulsations increase, but not at all in proportion to the disturbance of the respiration and general circulation.

When the great vessels on both sides of the neck are subjected to moderate pressure, more vigorous pulsations are first seen with gradual filling up of the cicatrix, which in five seconds swells out beyond the osseous edges of



the deficiency, and presents a bulging or tumour on the forehead, whenever the cicatrix reaches a level with the osseous edges, all pulsation ceases, and the surface of the cicatrix then assumes a dark red, or purple hue.

When the vessels on either side are subjected to pressure, an increase in the vigour of pulsation is noticed, but no swelling of the cicatrix. The increase is most perceptible when the pressure is applied to the vessels of the right side,—that of the deficiency.

When a fit occurs, the cicatrix is at first, as it were, drawn in, and greatly depressed, it then swells out beyond the osseous edges, all pulsation ceases, and it remains tense and turgid for an hour or more.

When he is irritated or angry, the pulsation increases, but there is no swelling out of the cicatrix.

When the interrupted galvanic current, or the constant current derived from fifteen cells is passed through the head, or through the sympathetic of the neck, no change in fulness or pulsation, but decidedly increased mental liveliness and animation are noticed. So rapid and considerable were the vascular changes in the brain, as displayed in the frontal deficiency of this man, that when watching them the idea was sometimes suggested that the brain in some respects resembles erectile tissue.

During his stay in the West Riding Asylum, T. N. continued, in spite of all treatment, to suffer from epileptic fits, frequent and severe. In 1870 he became phthisical, and on the 12th of April of the present year he died from pulmonary disease. At the post-mortem examination, the edges of the bone forming the deficiency in the forehead which has been described, were found to have been rounded off. In the centre of the depression, over a considerable area, the dura-mater was inseparably adherent to the skin. There was slight general milkiness of the arachnoid, and wasting of the convolutions. The frontal lobe of the right hemisphere was much shrunk and boggy, and formed, in fact, a sort of cyst, with clear serous contents, forming a dilatation of the anterior cornu of the lateral ventricle, and with walls of cerebral matter, grey and white, of varying thickness. Both lungs were tubercular, and the heart, which weighed 14 ozs., was hypertrophied on the left side.

Numerous other cases, besides those first adverted to, might be adduced from my experience and reading in proof of the proposition, that injury in the frontal region leads to the development of epilepsy and epileptic dementia. To mention only two of these, I find reported in the Appendix to Mr. Jonathan Hutchinson's singularly able Essay on 'Injuries to the Head,' which, although not published, I have had the privilege of examining, the case of John O'D., æt. 35, which is thus epitomised.—"Blow on the forehead, compound fracture of the right side of frontal bone, with much depression; laceration of dura-mater and escape of brain substance. No symptoms for twenty-four hours and no interference: violent convulsions followed by collapse. Trephining thirty hours after the

accident, and removal of bone. Death twelve hours after the operation."

Again in Sir Benjamin Brodie's works, we have the following case. "A gentleman on the 8th of September, 1825, was thrown from his horse, and falling on the pavement received a blow on the arm which occasioned a fracture communicating with the elbow joint, and another blow which caused the scalp to be separated for a considerable extent from the anterior part of the head, and also occasioned a fracture of the frontal bone, but without depression. He was taken up in a state of insensibility. He was in this state a few minutes afterwards, when he was seized with violent convulsions, his limbs being moved in various directions, and with such force that it was with much difficulty that several persons could hold him. The convulsions continued for about an hour when they subsided leaving him in a state of stupor. Blood was now taken from his arm after which he began to regain his sensibility. On the following day his sensibility was completely restored, and he recovered without any further unfavourable symptoms."

Now such cases have much light thrown upon them by Professor C. Westphal's experiments, on the artificial production of epilepsy in guinea pigs. That excellent observer found that when a guinea pig receives a blow or several blows on the head, which is firmly fixed, with a small hammer, or when its head is beaten against any hard substance, there follows an attack of convulsions. The attack occurs immediately, or from a few seconds to a minute after, and rapidly pass off leaving the animal quite lively, or with some temporary weakness in its anterior legs. "If the blows are too strong, death follows from cessation of respiration, the heart continuing to beat some four or five minutes longer. Artificial respiration may restore life. After a few weeks, the animal, having meanwhile entirely recovered its activity, upon pinching the epileptogenous zone on either side, especially the angle of the lower jaw, there occurs an attack perfectly analagous to those produced in animals operated upon, according to Brown-Séquard's method. The epileptic condition may set in when the blows are so slight as not to cause convulsions immediately. Four or five weeks are necessary to the development of the full epileptiform attacks,

though the difference in different animals is very great. As to the cause of this condition, it could not be by reflex action of the injured skin or periosteum, for when he removed both, and struck the exposed bone, the attacks followed in the same manner, as in uninjured animals. Autopsies made immediately after experiments which had succeeded in exciting convulsions, showed a moderate amount of effusion under the skin, without injury to the skull; the cerebrum and cerebellum, the crura cerebri, pons, hippocampus major, and ventricles, were without any constant lesion. There were, however, constantly found in the medulla oblongata, or the upper cervical portion of the cord, very fine small hemorrhages, from the size of a fine point to the size of a pin's head, irregularly scattered through the grey and white substance. Sometimes these lesions were found lower in the cord even as far as the dorsal region, usually there was also blood in the sac of the dura-mater spinalis and more rarely at the base of the brain."

Oxen felled by the poll-axe, are struck in the middle of the forehead at a point opposite the medulla oblongata, and are invariably convulsed until the whole brain is broken up by the introduction of an instrument for that purpose. I have found extravasation of blood in the medulla oblongata in several oxen, who have been killed by the poll-axe, and in whom, the brain has not afterwards been destroyed.

The important part played by the *contre coup* in determining the character of the consequences of cranial injuries, is indicated by various other classes of cases, besides those in which blows on the forehead have brought on epilepsy and its attendant train of evils. It is pointed out in those numerous instances in which violence directed on the vertex, or on the forehead, has resulted in abolition of one or more of the special senses. Two instances have come under my professional notice in which blows on this region of the head have caused permanent deprivation of taste and smell. A clergyman, whose eloquence attracts large congregations and botokens that his intellectual vigour is in no degree abated, consulted me some time ago respecting obscure cerebral symptoms which had haunted him ever since he was thrown from his horse and precipitated on to the crown of his head several years since. These symptoms consisted of pain in

the occiput, occasional flushings and congestions, and entire loss of taste and smell. Articulation remained perfect, the common sensibility of the face was intact, and that of the tongue was heightened, so that the slightest variations in the density of fluids were at once perceived, but no odour or sapor had ever been felt since the day of the accident.

M. C—, F., *ætat.* 50, was kicked on the top of the head when drunk, in December, 1865. On becoming sober and conscious, she was found to be quite deaf—having been previously possessed of acute hearing. She shortly afterwards manifested signs of insanity and failure of health, for which she came under my care. There seemed reason to believe that this woman, besides the deafness, which was permanent, laboured under some perversion of taste and smell, as she constantly asserted that poison was mixed with her food, and covered her mouth with her hand when speaking to any one, under the belief that her breath was horribly offensive.

In the 'British Medical Journal' for March 12th, 1870, there is reported the case of a girl who had become blind from a blow on the top of her head. "She stated that," five months before the examination, "she had struck her head against some sharp portion of a wheel. She was insensible for about two hours, and her nose bled. A day or two afterwards her eyes became blood-shot. She was troubled with sickness for several days after the accident, but did not seem to have vomited blood. There was neither deafness nor discharge from the ears. About four weeks after the accident, she suffered for several days from headache and sickness, and about the same time her sight began to fail, the right eye being affected first. When examined there was a depression, admitting the tip of the index finger in the scalp, nearly over the supero-posterior part of the right parietal bone. She was quite blind."

In the numerous reported cases, in which failure of the special senses has ensued, on injuries of the cranium, these injuries have, of course, occurred in every region of the skull—but still the vertex has been their site in a sufficient number to warrant the inference that the *contre coup* of violence at this point is particularly dangerous to the series of ganglia which lie at the base of the brain, and which are in direct connection with the nerves of sensation, and which have a rich vascular supply. Turning, however, from such necessarily vague and inconclusive observations, we have two situations, upon which we can fix



with more confidence, as influencing in a determinate manner, when injured, the succeeding modifications of mental action. These are the third frontal convolutions, with the gyri immediately surrounding them, and the cerebellum.

Without entering upon any critical examination of the different opinions, which have been set forth and promulgated, as to the cerebral centre of speech, which are admirably explained in Dr. Bateman's work on 'Aphasia,' we may at once perceive that most of those opinions have a convergent tendency, and that they point to the third frontal convolution, and the 'Island of Reil,' or that district of the cerebrum, as the region in which the faculty of language has its home, and in which lesion or degeneration must be sought when articulate expression of ideas is lost or impaired. This seems to be the general drift of opinion, and indeed it is difficult to understand how it could be otherwise, when a comprehensive survey is taken of all the cases of Aphasia which have been recorded. Of these cases, such a considerable proportion have exhibited the co-existence of loss of speech, with lesion in the region indicated, that no theory of accidental coincidence can be entertained as satisfactory. Of the remaining cases, in which no such co-existence was noticed, and which have, therefore, been quoted as contradictory of the view, that loss of speech is dependent upon change of structure in that portion of the encephalic mass, it may be said that they are bewilderingly at variance with one another, and prove either too much or too little, by showing that speech has no cerebral centre at all, or by failing to show that impairment or loss of speech was not actually dependent upon degeneration of the very convolutions in question, even when they were alleged to be perfectly healthy. Unless a careful microscopical examination has been instituted, it is rash and vain to assert of any nerve tissue that it is in a healthy state, and we cannot, therefore, attach much importance to these cases, in which affections of language have been present during life, and in which no alteration in the third frontal convolution or the central lobe, or any neighbouring gyrus, was visible to the eye after death. A vast amount of negative evidence of this description would be required to counterbalance the positive testimony furnished by



a few instances in which a distinct change of structure, appreciable by unaided vision, was found associated with a distinct impairment of a particular power. Given a certain number of cases in which the recollection and appropriation of words, and the use of articulate sounds, was imperfect, and in which a coarse change in the third frontal gyrus and central lobe was the only visible morbid condition in the great instrument of thought and its expression, and the conclusion seems irresistible that the one defect must hold a casual relation to the other. The cases which have been reported, in which injury of the cerebral gyri just mentioned has been followed by loss or limitation of speech, amount indeed to a demonstration that speech is localized in these gyri. These cases, which are really experiments of the most crucial kind performed upon the brain, have not yet received the attention which they deserve in connection with the pathology of aphasia and amnesia. Gall tells us that a young man at Marseilles was wounded by a foil above the eyebrow, and that from that moment he could not recall the names of his dearest acquaintances. He also recounts a history submitted to him by Baron Larrey, referring to an individual who was injured by the same instrument, a foil, which penetrated below the internal canthus of one eye, and went through the cribriform process of the ethmoid bone, into the anterior lobe of the brain, resting on the orbital plate of the other eye. Hemorrhage and paralysis were the immediate effects which were succeeded by the extinction of the senses of vision, taste, and smell, hearing being also imperfect on the side principally injured. The voice was likewise lost. The senses gradually returned, and the patient was able to speak, but he could no longer affix the proper names to objects, though the perception of their qualities remained unaffected. He recollected clearly the person, figure, and features of M. Larrey, and recognised him at once, but notwithstanding this he could not recall his name, but designated him M. Chose.

In the 'Encyclopedie Methodique,' Article, *Medecine Mentale*, there is an instructive narrative by M. de Fouchy, which illustrates how affections of language may supervene upon injuries in or around the orbits. "On the 24th of March," says this gentleman, "when returning home from the house of M.

Amisson, a projecting part of the pavement tripped my foot and caused me to fall forwards and to one side with my face on a heap of stones. The blow struck me precisely on the vomer and on the angle of the right eye; the skin covering the former was cut and bled much. I felt at the moment an acute pain which extended along the left eye, but I was in no degree stunned. Next day the pain in the vomer was accompanied by a slight internal crepitation when I moved that bone to the right or left. Towards the end of dinner, I felt a slight increase of the pain above the left eye, and at that very instant became unable to pronounce the words which I wished. I heard what was said to me, and thought what I wished, but I pronounced other words than those which would have expressed my thoughts. or, if I begun I could not finish them, but substituted other words for them. I had, however, the power of every motion as free as in my usual state."

Romberg relates the case of a sailor boy, æt. 15, who, while hoisting a sail, was struck by a rope on the left side of his head, and at once fell down in a state of insensibility. After a quarter of an hour he recovered himself but was found to have lost the use of the right half of his body and to have become speechless. The tongue when protruded was drawn to the paralysed side, but could be moved in every direction without difficulty; but the faculty of speech was arrested, although perfectly conscious, it was only with the greatest difficulty that the boy was able to utter a few inarticulate sounds. This case terminated in complete recovery.

In the 'Lancet' of June 29th, 1844, there appears the account of a case by Dr. Turchetti, in which, after a gun shot wound of the face, there was complete mutism without any disordered intelligence for nine days, after which, however, paralysis and coma set in, and speedily terminated in death. At the autopsy it was found that just one shot had penetrated the skull, and had lodged in the frontal lobe on the left side, where it had produced softening and suppuration. The whole of the right hemisphere and the middle and posterior lobes on the left side were in a normal condition.

In the twelfth volume of the 'Phrenological Journal,' there is an accurate account by Dr. Smith and Mr. Niddrie, of the case of

a lad, æt. 14, who sustained a severe injury under the left eyebrow, from the spout of an oil jar upon which he fell, and who, after a period of insensibility, recovered consciousness, but was unable to speak. Although understanding all that was said to him and capable of answering by signs, he could at first utter no word, and, as he got better, articulated very imperfectly, and could not recall the names of objects.

Until the 12th of November, 1870, there was in the West Riding Asylum, an idiot, J. B., from Barwick, about whom very little information could be obtained beyond the facts that his head had been hurt in his infancy, and that he had always been weak minded. He was mute but not deaf. He recognised his name, turned round when called to, and endeavoured to express his meanings by movements of his hands and harsh articulate cries. Although educable to such an extent that he learnt to wheel a barrow, he could never be taught to speak, and died at the date above mentioned, from broncho-pneumonia, aged 35, without having acquired even a single word. At the post-mortem examination of his body, there was found, besides cranial contraction and arrested cerebral development, a cyst with thick tough fibrous walls and serous contents occupying the sylvian fissure on the left side at the tip of the temporo-sphenoidal lobe. This cyst, which was the size of a large walnut, had occasioned either stoppage of growth or atrophy in the adjacent gyri. The third frontal convolution, the posterior orbital, the superior temporo-sphenoidal, and the central lobe, were all flattened and partially obliterated.

It would be tedious to introduce numerous other cases which have been collected, exemplifying how injury of the third frontal or orbital gyri, or those of the central lobe, is followed by limitation, or abrogation of the power of language. Enough has been said to show that there is at least a high probability than any violence done to these parts will have such a result. It remains to add that injuries of these gyri, in order to produce aphasia, need not necessarily occur on the left side. The left hemisphere, or any part of it, has not an exclusive property in language. Such an arrangement, involving a unilateral distribution of function in a bilateral organ, would be contrary to all analogy, and is negatived by certain facts. No doubt aphasia is much oftener associated with right than with left hemiplegia, and we are not without feasible explanations why that should be so, but still it is occasionally associated with loss of power on the right side, and that is sufficient to show that speech is related with a centre in each hemisphere.

The exact functions of so large and important an organ, as

the cerebellum, are still undecided, but most authorities incline to the belief that it is in some way connected with the genital system, and is the seat either as a whole or in part of the sexual instinct or of the sexual sensation. When so accomplished a physiologist as Dr. Carpenter, who will certainly not be suspected of any phrenological bias, is found supporting the latter view, and when Brown-Séquard is found corroborating it, and attributing to irritation of the cerebellum an exaggeration of the sexual desires, there can be little hesitation in accepting it as true in the main, but as subject to qualification hereafter in accordance with the increased accuracy of our knowledge of the nervous centres. The effects of injuries, in the region of the cerebellum, are strongly confirmatory of the opinion that it is in intimate relation with the sexual appetite and apparatus. Baron Larrey recounts the case of "Bigot, a light horseman, of a strong and very amorous constitution, who received, at the battle of Benevento, a cut from a sword which divided the skin and all the convex or projecting portion of the occipital bone through to the dura-mater of which a very small part was touched. The right lobe of the cerebellum was seen through the opening of the dura-mater. The slightest pressure upon this organ caused giddiness, fainting, and convulsive movements. From the first day the patient lost the sight and hearing of the right side. He experienced at the same time acute pain in the course of the dorsal spine, and a kind of tingling in the testes; these diminished sensibly, and in fifteen days were reduced to the size of a bean. Soon after he lost all idea or recollection of past sexual excitement. The patient at one time gave hopes of cure, except with regard to the functions of sight, hearing, and generation, but soon relapsing he died ultimately of tetanus. On dissection, great loss of substance at the occiput was found; the opening of the dura-mater corresponding to the right lobe of the cerebellum, which was shrunk, was of a yellow colour, without suppuration or effusion. The medulla oblongata and upper part of the spinal cord were of a dull white colour, of firmer consistence than usual, and reduced in size by one-fourth."

Two more cases of a similar description to the above, are given by Larrey, and others of a like kind might be derived



from the writings of Hennen and Lallemand. Mr. Curling, in his treatise on 'Diseases of the Testis,' says, "a few years ago, a man who had met with an injury of the head, which had been followed by wasting of the testes, and the development of tumours on each side of the chest, resembling mammæ, presented himself at the different hospitals in London. I saw him in March, 1828, at the London Hospital, when he had the appearance of a man who had seen hard service. He stated that he was fifty-nine years of age, a married man and the father of several children. He had belonged to the legion in the Queen of Spain's service. About two years and a half previously, in an attempt to jump over a trench in a retreat, he fell backwards and injured the posterior part of his head. Whilst on the ground he received a bayonet wound on the left side, and a sabre cut on the forehead of the same side. He recovered from these injuries and returned to England; since the accident he had completely lost his virility. He had no desire for sexual connection, his penis had dwindled in size, his right testis had gradually wasted and was no larger than a horse bean, and the left gland was also a good deal diminished in bulk. The skull at the occiput seemed somewhat flattened."

The 'American Medical Intelligencer,' for February, 1839, contains copious details of the case of a gentleman, who, having his head out at the window at the moment when two railway trains came into collision, received a severe injury on the occiput from the edge of the window frame, and was insensible for a time. On his recovery he suffered great pain in the region of the cerebellum, so that he could not rotate his head for some time without pain, and experienced the following curious symptoms. There was numbness of the right arm with paralysis of the bladder; surrounding objects presented an unusual appearance, near objects seemed to be at a distance, and the street, when he was walking in it, looked of interminable length and as if sunk somewhat below him. He always felt as if elevated above the ground on which he walked. Sexual desire and the power of intercourse were absolutely lost, and no amorous sentiment ever entered his mind for many months.

The localization of the sexual instinct, or of sexual sensation in the cerebellum, does not of course preclude the localization



there also of a power of co-ordination of muscular action or of control over nutritive and developmental processes. On the contrary, certain relations between these functions render it probable that their centres are not widely apart, and the cerebellum is certainly sufficiently differentiated in structure to admit of having highly differentiated functions. Serres thought that its lateral lobes are connected with locomotion, and that its central lobe is the seat of animal passion. And cases to confirm this view are not wanting, in which an extraordinary salacity has been associated in aged persons, with a peculiar unsteadiness of gait or defective power, in co-ordinating movements, and in which disease in the cerebellum, extending from the central lobes to the hemispheres, has been demonstrated after death. Lallemand recommended gymnastics as the best means of treatment for boys addicted to onanism, and it has been often noticed that violent muscular exercises diminish sexual vigour and suspends desire in certain persons. An interesting case in which injury at the back of the head induced a state of irritation of the cerebellum which manifested itself either in great muscular activity, or in sexual excitement, is now under my care.

W. T., ætat. 56, from Barnsley, married, and a tailor, was admitted to the West Riding Asylum, on the 2nd October, 1869. Some years ago he tumbled down stairs and hurt the back of his head, ever since which he has complained occasionally of uneasy feelings there. He has had several attacks of recurrent mania, and is now in a state of chronic mania. When he was a little worse than he now is, it was remarked, that while working out of doors, engaged in severe muscular exertion in digging and wheeling barrows, he was comparatively chaste in his thoughts and conduct. He expressed no lust and was not obscene in his conversation. But while working in the tailor's shop, and therefore engaged in a light sedentary occupation, he displayed exaggerated activity of the sexual propensity. He openly and constantly declared his libidinous desires, talked perpetually upon disgusting themes, and could not be trusted in the presence of females. His occupation was changed repeatedly and always with the same results. As regards diet, clothing, and regimen, he was similarly situated, whether employed in the shop or on the land; the only difference in his condition being, that in the one case he was deprived of the muscular exercise which he enjoyed in the other.

#### THE PATHOLOGICAL CHANGES DEPENDENT UPON CRANIAL INJURIES.

In enumerating these, and scarcely more can be here accomplished, it is necessary first to mention microcephalus, and the

several forms of cranial distortion, which result from crushing of the head at birth, or from injuries of the head sustained in early years. A general arrest in the growth of the head without any loss of proportion in its several parts, is, I believe, one of the consequences of violent or numerous concussions in infancy or childhood. This arrest in growth may intervene at any point in development, and hence we may have a head only slightly below the average size, or one so small as to be an unmistakable signal of idiocy. It has often appeared to me, that professional acrobats have unusually small heads, although upon this point, which is worthy of investigation, I have as yet no definite information. Be that as it may, those idiots who are idiotic because of cranial injuries, have most commonly diminutive or deformed heads. When concussion has been the source of evil, the skull is small but symmetrical as if the brain had simply stopped growing too soon, but when fracture, or crushing have occurred, there is often distortion and inequality. An extravasation of blood may cause a unilateral atrophy by pressing upon one hemisphere, or even a more local atrophy by mechanically obstructing the growth of a lobe, or even of a few convolutions, and may thus interfere with symmetry of form and action. A fracture, depression, or abrasion of bone may be permanent and thus entail deformity, or may induce certain anomalies in osseous nutrition, resulting in general or partial thickenings of the skull, or in premature ossification of one or more sutures. I am quite satisfied that in a number of instances premature synostosis of the sutures of the arch or of the base of the cranium with interruption of growth, is to be ascribed, not to any mere sport of nature, but to slow inflammatory changes in the sutures and cartilages due to violence operating upon the skull.

But encephalic processes also due to fractures, depressions of bone, and bruises, and lacerations of brain substance, may terminate in atrophy of the affected parts, in sclerosis or in supuration, and the formation of abscess, or in tubercular deposits. In acute inflammation of the brain and its membranes, arising from injuries of the head in childhood, there is always intense redness and congestion of the pia-mater, velum interposition and choroid plexuses, with effusion of serum more or less copious,

and these morbid changes, though comparatively slight and temporary, may interfere to a perilous extent with cerebral development, especially when the brain which they affect is endowed with any inherent weakness or vice. But beyond these morbid changes, there is ordinarily an abundant deposit of lymph on the surface of the convolutions, or at the base of the brain, with an obvious liability to alterations in the character of the exudation, rendering it a permanent hindrance to brain growth. Phlebitis of the sinuses of the dura-mater is found sometimes in children succeeding injuries. This disease, in a majority of instances, terminates in blocking up of the inflamed veins with fibrinous clots, and in consequent death, but it is, I think, conceivable that when limited to one locality, or when mild in degree, it might end in mere thickening of the veins involved, with roughning of their lining membrane, and perhaps occlusions in some small ramifications, and might thus induce a condition of impaired cerebral activity and mental weakness.

Notwithstanding an opinion to the contrary, which is entertained by some very competent authorities, I am quite convinced that injuries of the head in children of strumous diathesis, frequently bring on attacks of tubercular meningitis. These attacks, if severe, hurry on into death, but if subacute, they pursue a more tardy course and spare life but entail idiocy, imbecility, or intellectual feebleness, with emotional excitability. I have had several cases of idiocy under my care which had undoubtedly originated in tubercular meningitis, which, in one at least, had been induced by a blow on the head. When blows on the head in scrfulous children are followed by a severe and perhaps rather obscure illness, marked by fever, delirium, vomiting, &c., and when, after the subsidence of this illness, some degree of mental peculiarity or impairment remains, there are good grounds for holding that tubercular meningitis, to a slight extent, has followed the injury, and has resulted in thickening of the arachnoid or pia-mater, in scattered and minute deposits of miliary tubercle in the latter, in adhesions between the lobes and hemispheres, especially at the base, in proliferation of nuclei in the ependyma, or in textural alterations in the grey and white nervous matter.

But when no attack of acute meningitis has intervened,

tubercles may still be deposited in the brains of children as a consequence of cranial injuries. They then usually occur in rounded nodulated masses or in irregular patches, either grey and translucent, or yellow and cheesy. Their favourite site is the cerebellum. In a child who had fallen on the back of its head cerebral symptoms speedily showed themselves, first delusions and hallucinations, then dullness with unsteadiness of gait, squinting, screaming, and vomiting, terminating in death in two months. A mass of tubercles of about the size of a walnut, and presenting a rather grey translucent appearance towards its circumference was discovered in the right hemisphere of the cerebellum. There was also a large amount of fluid in the ventricles which was attributed to obstructed venous return from pressure of the tumour on the *venæ Galeni*.

The state of irritation or weakness induced by violent concussion may eventuate in effusion of serum or chronic hydrocephalus, the accumulation of fluid being either in the ventricles or in the cavity of the arachnoid, and this may occur in the adult as well as in the child. A state of dropsy of the brain is perhaps the most frequent pathological result of concussion in aged persons, and in those who have just passed the middle period of life, but in them the fluid which is found beneath the arachnoid and in the meshes of the pia-mater is effused, not owing to obstructed venous return or changes in the vascular walls, but to compensate for atrophy and wasting of the proper nervous tissues. Concussion at the period of life named seems to tend, in many cases, to precipitate the incursion of these changes, which are characteristic of extreme old age, and to carry them far beyond the point to which they usually advance. It anticipates senile decay and sometimes causes second childishness at a time when life is scarcely past its meridian. There is a malnutrition of the brain cells and they disintegrate. The brain tissues shrink and shrivel, and to fill the space, which they vacate in wasting, serum is poured out.

During youth and early maturity, concussion and other cranial injuries occasionally induce a condition of cerebral sclerosis. This is particularly likely to happen where the immediate result of the injury has been epilepsy, which, by the repeated congestions which it causes or in some other way, is apt to



produce induration of the cerebral structures. Under such circumstances, the hemispheres are tense and hard, and offer increased resistance when pressed by the fingers. The medullary substance has a peculiar white glistening appearance. On microscopic examination the cortical matter is seen to be composed of a dense stroma with a quantity of granule cells. Firm compact bundles of fibres containing oval or stellate cells, are everywhere observable. In some places the proper nerve cells and fibres are scarcely to be recognised. A state of sclerosis, of limited extent, is frequently found in the site of any laceration or wound of the brain, from which recovery has taken place.

White softening of the brain may follow concussion, or a cranial injury in which no encephalic clot or breach of continuity has occurred, especially when the vessels are atheromatous. The defective nutrition of the nerve structures, due to the atheroma, favours a rapid ramollissement. I recently examined the brain of a man, who had died from gangrene of the toe at the age of 77, and in whom, senile dementia had been developed immediately after a fall into a cellar, and injury of the head. The walls of the vessels at the base of the brain were much thickened, opaque, and of a dirty yellow colour and the whole of the medullary substance of the right hemisphere had undergone a diminution in consistence, so that it was soft and pulpy, but no trace of a clot could be anywhere detected.

It is unquestionable, however, that extravasations of blood and the transformations which they undergo, constitute the most frequent pathological appearances after injuries of the head. The character of these appearances of course depends very much upon the amount and position of the hemorrhage. If a large quantity of blood is extravasated on the surface of the hemispheres, without causing death, a coagulum is formed, absorption of fluid takes place, a membrane of low organization is developed round the clot, and an arachnoid cyst is the result. A similar course of events may lead to the formation of a cyst in the ventricles. If smaller capillary hemorrhages occur in the cerebral substance, there is breaking down of tissue, coagulation, absorption, and contraction, with puckering and some permanent hematoidine crystals giving a rusty or orange colour to



the cicatrix. Small cysts may also be formed in the brain substance and several species of degeneration may have their starting point and centre in the clot, especially red or white softening, or an inflammatory process, leading to suppuration, and an abscess sometimes small and circumscribed, and sometimes involving nearly the whole of one hemisphere.

### THE MENTAL EFFECTS OF CRANIAL INJURIES.

1. *Prolonged Suspension of Consciousness.*—What is commonly called unconsciousness or insensibility, is, of course, one of the most invariable and characteristic of the immediate consequences of all serious cranial injuries. A state in which the mind is dormant, in which the senses are in abeyance, in which attention cannot be roused, and in which no voluntary act can be performed almost inevitably ensues when the encephalon is subjected to violent concussion, to compression, or laceration, or other structural lesion. But this state is, as a general rule, of comparatively brief duration, and eventuates either in restoration of consciousness, or in its obliteration in death. The patient shakes off his lethargy, awakens and resumes his communications with the outer world, or he sinks into coma, becoming more and more profound, until at length all his mental and vital energies are interrupted. Sometimes recovery from the unconsciousness arising out of a cranial injury is rapid and complete. In the course of a few minutes, the mind is again operating as if nothing unusual had happened. Sometimes again recovery is tardy, and partial, unconsciousness being maintained for hours or days, and being only gradually replaced by impaired mental activity. Rarely the restoration of consciousness is indefinitely postponed, a state resembling deep slumber being continued for weeks or even months. A sailor who was wounded in the head, while taking a prize in the Mediterranean, in June, 1799, lived to use the words of Sir Astley Cooper, “a year unconscious of his existence.” Mr. Clive, the surgeon, performed on him the operation of trepanning in London, a year after the injury. The portion of bone that had been driven in was raised and thus the patient recovered perfectly, in a few days, the use of his brain and mental faculties.

Several cases, resembling that just briefly described, have been reported, though few of course equal it in the extraordinary prolongation of the unconscious condition. Such cases it is thought desirable to separate from others illustrating the mental consequences of cranial injuries, because they have certain features which are peculiarly their own, and approach more nearly than any other with which we are acquainted to complete amentia or privation of all the mental powers. The man whose consciousness is thus continuously suspended gives fewer manifestations of mental life than an idiot of the lowest type. He is anencephalous to all practical intents and purposes. He presents an example of the lowest degree of mental activity which is compatible with being, and yet he lives and thinks. An analysis of his condition and experience affords corroboration of the philosophical doctrine, that the mind is never wholly inactive, and that we are never wholly unconscious of its activity, but that the degree and character of its manifest activity are subject to wide variations. It indicates that sleep, which has been alleged by some to be an entire abrogation of consciousness, is really a state of comparative conscious activity, and that some dream-thread is ever drawn through states of far more profound mental obscuration than any natural sleep with which we are acquainted. All those who have recovered from a prolonged suspension of consciousness display a striking inappreciation of any passage of time. They take up consciousness again at the precise point at which they laid it down, unlike the sleeper who brings with him out of what we term the unconsciousness of sleep, a consciousness vague, but still appreciable of a lapse of time, they awaken, as if they had never slept. They resume the very thought upon which their unconsciousness had broken in. It is told of a British captain, that at the battle of the Nile, he was giving an order from the quarter-deck of his vessel, when a shot struck him on the head, depriving him immediately of speech. As he survived the injury he was taken home and remained deprived of sense and speech in Greenwich hospital for fifteen months. At the end of that period, during which he is said to have manifested no sign of intelligence, an operation was performed on the head, which almost instantaneously restored him to con-

sciousness. He then immediately rose from his bed, and not recognising where he was, or what had occurred, expressed a desire to complete the order which had been so abruptly interrupted when he received the injury fifteen months before. A lady, whose case is given by Dr. Abercrombie, was seized with an apoplectic attack, while engaged at cards. The seizure took place on Thursday evening—she lay in a state of stupor on Friday and Saturday, and recovered her consciousness rather suddenly on Sunday. The first words she then uttered, were “What is trump.” One idea or class of ideas had been persistent throughout her trance, and that trance itself was ignored. Illustrations of both of these experiences are occasionally met with.

G. W., who was an inmate of the Newcastle Borough Asylum, in 1865, exemplified the stereotyping or fixing of a thought by a cranial injury. He had been struck down, and deprived of sensibility, by a piece of iron, while engaged in the construction of cannon, at Sir William Armstrong's factory at Elswick. When he recovered consciousness he was insane, and all his ideas were concentrated upon great guns. His constant delusion was that he could kill myriads of armies of men in a minute, and perform other marvellous achievements by a machine which he had himself invented, and the imaginary handle of which he turned perpetually, sometimes with such energy that he was ready to fall down from exhaustion.

The clean excision as it were of a portion of life, on the other hand, is exemplified by—

W. H.—, lately an inmate of the West Riding Asylum, to which he was admitted on November 20th, 1871. Twelve weeks before his admission, he was struck on the head, fell backwards upon the pavement and was brought home ‘like a dead man.’ He bled from the nose and from one ear and remained altogether unconscious for fourteen days. When he recovered consciousness, he became delirious or maniacal, and continued so for ten weeks, when he was brought here firmly secured in a straight waistcoat, although he was comparatively tranquil and rational. From the hour of his admission he gained ground rapidly and was soon quite convalescent, when his own account of his illness was as follows.—“I was walking in the street, when a man struck me on the head, and then the police came and put the jacket on me and brought me here.” Nothing could enable him to recall any experience or event intervening between the accident and his removal to the asylum. He had lost exactly three months. There was a gap in his life of which he knew nothing including his prolonged suspension of consciousness for fourteen days, and his maniacal excitement for ten weeks. He had not the most indistinct reminiscence of this period, nor was he able to realize, as convalescents after mania always do, that his memory was defective, and that he had passed through experiences which he could not recollect.

Even blank forgetfulness of this description, however, in which a chapter of life is as it were erased, cannot be taken, to mean that memory is not stored with some knowledge, of what seems unknown, which may be reproduced under certain circumstances. Abercrombie gives the history of "a boy who, at the age of four, received a fracture of the skull, for which he underwent the operation of trepanning. He was at the time in a state of stupor, and, after his recovery, retained no recollection either of the accident or of the operation. At the age of fifteen, during the delirium of a fever, he gave his mother an account of the operation, and the persons who were present at it, with a correct description of their dress and other minute particulars. He had never been observed to allude to it before and no means were known by which he could have acquired the circumstances which he mentioned."

Prolonged suspension of consciousness — almost without exception—depends upon compression of the brain, by depression of bone, or extravasation of blood, or lodgment of a foreign body, and that to some considerable extent. Where diminution in the cavity of the cranium—due to these causes—is only trifling in extent, the brain rapidly adapts itself to its curtailed position, so that consciousness is carried on, and cerebral inconvenience is betrayed in the mind's aberrations. But where great pressure is exerted upon the cerebrum, prolonged stupefaction occurs. It is difficult to say what determines the protraction of this stupefaction in one case, while in another it terminates in a few hours or days. There is a probability, however, that wherever consciousness is suspended to an unusual extent, concussion and compression have co-operated to secure that result. The former, or 'cerebral surprise' as Trousseau calls it, has set up a state of molecular or chemical change, which the latter has maintained, without interfering with cerebral nutrition. The encephalic tissues have not degenerated, so that they are ready to resume their functions whenever a change back to their normal condition takes place.

2. *Improvement in Mental Power.*—Singular though the statement may at first sight appear, it is undoubtedly true that cranial injuries are occasionally beneficial in their effects.



Instead of the grievous consequences which most frequently accrue from them, we have sometimes to trace to them an increase of mental vigour, a restoration of reason which had been withdrawn, and even a removal of the restrictions of idiocy. "I have been informed," says Dr. Prichard, "on good authority, that there was some time since a family, consisting of three boys, who were all considered as idiots. One of them received a severe injury to the head, and from that time his faculties began to brighten, and he is now a man of good talents, and practices as a barrister. His brothers are still idiotic or imbecile." Grety tells us of himself that he was indebted for his musical genius to a violent blow inflicted on his head by a falling beam of wood. Petrarch mentions that Pope Clement VI. found his memory wonderfully strengthened after receiving a slight concussion of the brain. Louyer-Villermay describes the case of a man who suffered from a paralysis of memory following a severe blow upon the head. He was fortunate enough to have a repetition of the physical injury, and, as the result of the accident, his memory was immediately restored to him in all its original strength. Father Mabillon is said to have been in his younger days an idiot, continuing in this condition until the age of twenty-six years. He then fell with his head against a stone staircase and fractured his skull, for which injury he was trepanned. After recovering from the effects of the operation, his intellect fully developed itself, and he is said to have exhibited, subsequently to the accident and operation, a mind endowed with a lively imagination, an amazing memory, and a zeal for study rarely equalled. Dr. Forbes Winslow reports the case of a lady who, while suffering from an attack of acute puerperal mania, leapt from a third-floor window and was severely stunned by the fall, so that she was insensible for a few moments. When she was restored to consciousness, she was also restored to her right mind, and only subsequently complained of weakness and nervous exhaustion. Dr. Malin relates three cases, in Casper's '*Wochenschrift*,' in which improvement in intellectual endowments, and a relief from stupidity, resulted from cranial injuries.

In all cases of this kind, which have been reported, it is to



concussion that the benefit experienced must be ascribed. That seems to be the developing and educational agent under such circumstances. The vibrations, in which it essentially consists, determine some cerebral change, which renders the grey matter of the hemispheres better fitted for the manifestation of mental phenomena. Just as the words, "fall in," may convert a confused mob into a well ordered battalion, so may the shock of concussion turn a mass of nerve cells into a human brain. The nature of the change, which concussion, thus operating, induces in the vesicular neurine, can only be a subject of speculation, but it seems highly probable that it is analogous to that which the Faradic stimulus has been shown to establish in certain tissues, when it places them in a state of physiological activity. No structural alteration is effected; but a modification of condition and relation is introduced amongst the existing elements, and healthy metamorphoses are favoured. The molecular equilibrium of the parts involved is disturbed and an opportunity is afforded for natural development, or for the revival of impaired function.

That the character of the alteration, wrought in nervous centres by concussion when it invigorates defective mental powers, as in the cases above cited, is really closely allied to, if it is not identical with, an electrical modification, is rendered clear by a variety of considerations. Concussion and electricity present resemblances in all their actions upon the nervous centres. Both may kill these centres without inflicting any perceptible injury; both may damage and disorganize these centres and interfere with their physiological uses, and both may stimulate and strengthen those centres and ameliorate any defects under which they may labour. For just as concussion, as we have seen, may break down the barriers of mental limitation, and brace enfeebled nervous energy, so may electricity, and that, too, in a way equally instantaneous and remarkable. Dr. Hammond tells us, that in the treatment of paralysis due to wounds of old standing, Faradization has, in his hands, proved curative in the most rapid and marvellous way. In some cases, he says, it has, at a single application, restored the power of movement to parts which had been long deprived of it; in others, a few applications have more or less completely restored

the power of movement to an entire limb. Dr. Rorie has placed on record a case in which persistent hallucinations of hearing were at once abolished, by the transmission of an interrupted current from ear to ear, and Benedict refers to an idiotic boy who was improved by galvanization of the brain although not to any great extent. In these cases, and in others of a like description which might be quoted, the beneficial influence of the electricity was certainly not exerted indirectly through the circulation or through nutrition. It arose immediately, and could be due to nothing but a molecular movement or change, involving the reversal of a morbid relation. Suddenly health and harmony flashed back, and cosmos came out of chaos. Similar re-creations and instantaneous recoveries from the incompetency of disease, have taken place without the aid of electricity or concussion, and, being then initiated by a thought or an emotion, have been even more clearly attributable to some subtle wave or current of innervation. Dr. Prichard, on the authority of the late Dr. Rush, of Philadelphia, mentions an American student, a person of considerable attainments, who, on recovering from a fever, was found to have lost all his acquired knowledge. When his health was restored he began to apply to the Latin Grammar, had passed through the elementary parts, and was beginning to construe, when one day, on making a strong effort to recollect a part of his lesson, the whole of his lost impressions suddenly returned to his mind, and he found himself at once in possession of all his former acquirements.

Some light is thrown on the action of concussion in the relief of mental infirmity by a curious case which has been recently under my observation. A girl, who is now eighteen years of age, has been, for ten years past, subject to epileptic fits, which are invariably preceded by an aura, which the girl herself names 'a fainting belly-ache,' and describes as 'feeling frightened at the pit of her stomach.' This sensation at the epigastrium premonishes the fit by about twenty seconds, and gives time for assistance to be called for, which is always done in these words, "bump my back," very piteously and earnestly uttered. If, between the commencement of the aura and the incursion of the convulsions, there is time to comply with her request and ad-

minister to her two or three smart blows over the lumbar vertebræ, the fit is for the time averted. Now an aura is unquestionably a peculiar induced molecular condition of the peripheric expansion of a centripetal nerve, which is propagated centripetally. Its propagation can be arrested by ligature or division of the nerve involved; and, in the case just mentioned, it is arrested by concussion of that nerve, or the ganglia connected with it. It is difficult to understand how concussion thus acts instantaneously, except by producing a reversal or exchange of the electric relations of the exterior and interior of the nervous molecules. Surely a like reversal or exchange must have taken place in the nervous centres of a horse, which, as Dr. Malin testifies, was radically cured of the staggers, (*Dummkoller*) by a heavy blow on the head, given by its master with the purpose of killing it.

An illustration of the instantaneous action of concussion, in improving mental power, or at least in abridging the process of recovery from mental disease, was afforded to me some time ago.

W. W. was lately an inmate of the West Riding Asylum. This man was emerging from a state of mania, and was passing through a stage of delusional extravagance, which my experience of a previous attack led me to anticipate would be protracted for several weeks. One day I conversed with him, at my morning visit to the wards, and found him busied with Utopian schemes for paying off the National debt, going into partnership with Baron Rothschild, and forming a lodge of female freemasons. I met him again in the afternoon, and found that he was changed in two respects; in the first place, he had a couple of very obtrusive black eyes, and in the second, he was perfectly calm and reasonable. His own account of this double transformation was that, with the view of selling some imaginary shares, he had gone up to an irritable epileptic patient, who, instead of entertaining his business proposals, had struck him forcibly on the bridge of his nose. The blow he said had had a very sobering effect, and had knocked the nonsense out of him.

It is, I am satisfied, to the effects of a concussion in cases like that just adverted to, that most of the advantages, alleged to have been derived from that old method of treating insanity, the circulating swing, must be traced. That good results were sometimes obtained from the use of that most cruel and barbarous invention, will be apparent to all who peruse the writings of Drs. Darwin, Cox, Hallaran, and other physicians who recommended it at the time when it was in vogue. It cannot be credited, that these acute and intelligent observers were all mistaken in asserting that it sometimes cut short the course of

mania, and contributed to recovery. And whatever good or evil, and doubtless the latter preponderated to a terrible extent, resulted from the swing must have been arrived at chiefly through concussion. The swing consisted of a small box, or chamber, fixed upon a pivot and worked by a windlass, in which the person to be operated upon was firmly strapped either in a sitting or recumbent posture, after having been prepared for the process by a calomel purge. This box was made to whirl round with great rapidity, a hundred revolutions in a minute being considered a fair average velocity, and its action was supposed to be heightened by reversing its motion every six or eight minutes, and by stopping it occasionally with a sudden jerk. The immediate effects of the use of the swing were lowering of the circulation and of the general temperature of the body, with copious evacuations from the stomach, bowels, and urinary passages, and the secondary effects included profound and protracted sleep, diaphoresis, mental calmness, and an intense and not incomprehensible dread of a repetition of that particular method of treatment. When carried too far the swing has been known to bring on congestion of the brain, and to cause a peculiar suffusion of the countenance which left traces of ecchymosis behind it. Its milder effects were distinctly indicative of cerebral concussion, which is well known to result from rapid revolutions, such as those inflicted by the swing, and which may even eventuate in death, as was the case in a boy, whose symptoms are reported by Mr. Jonathan Hutchinson, in his essay on 'Injuries to the Head.' It is, therefore, probable that the improvement in mental condition, which sometimes followed its employment, was also connected with concussion and changes dependent thereon, rather than with any moral impression which it might exert upon the "inflexible maniacs" who were 'subdued' by it, and the paroxysmal maniacs whose attacks it was instrumental in cutting short.

3.—*Change of Character.*—Amongst the most common consequences of cranial injuries, is a change in the character, disposition, temper, or habits of those who have suffered them. This may be trifling in extent and degree, and may long escape detection, or it may be wide spread, and radical, and at once



make its existence obvious. Stopping short of actual insanity and being unaccompanied by any failure of the faculties, such an alteration of ordinary nature and familiar tendencies, nevertheless, can only be regarded as morbid, and due to cerebral derangement. Similar perversions of character are frequently seen associated with bodily disorders. Unusual irritability or moroseness, or hilarity are sometimes but expressions of diseased livers or lungs. Voltaire, contemplating this subject, remarks "that costiveness has too often been the cause of the most sanguinary and dreadful scenes,"—a position which he illustrates by affirming that Oliver Cromwell suffered under this disorder for upwards of a week before he signed the death warrant of Charles I., and that the same state of matters, in Charles IX. of France, was one of the principal causes of the massacre of St. Bartholomew. It is with perversions of character, however, more sustained in duration or more frequent in recurrence than those which engaged the attention of Voltaire, and which originate in visceral sympathy, that we have to deal in relation to injuries of the head. Instead of mere temporary aberration of temper or sentiment, such as signifies some bodily malady we have, when cranial injuries are concerned, to encounter a permanent deterioration in morals, a final substitution of cruelty for kindness, of poltroonery for manliness, of rashness for foresight, or constantly returning outbursts of unaccountable irascibility, or excitement, or despondency.

The permanent or intermittent character of changes of disposition, resulting from cranial injuries, seems to be dependent on the kind of injury from which these changes have proceeded. When there has been any solution of continuity in the skull or brain, when fracture, laceration, or loss of substance has been sustained, then the consequent changes are almost invariably permanent in type, though, perhaps, subject to exacerbations, but when only concussion without any coarse lesion has been suffered, then these changes may be paroxysmal and present themselves after longer or shorter intervals. In other respects these changes vary infinitely, according as they involve more or less of the mental constitution, and are more or less malignant in their influence. Pinel has shown that they may amount to a sanguinary instinct developed in a previously humane and virtuous



man, and may carry him without any reasonable motive into the most terrible excesses. This must have been the case with the notorious duellist "fighting Fitzgerald," who, prior to a blow on the head, was a most mild and placable person, and, who, after that accident, was a relentless fire-eater. Some authors describe a loss of all animation of spirit, and a state of excessive torpidity and hebetude, as resulting from concussion, a condition which recalls, as analagous in the somatic sphere, that extraordinary obesity and general stoutness which have been observed in those who have been blown up by explosions of gunpowder, and have survived the adventure. Other authors again describe extreme irritability, with outbursts of violent anger and selfish rage, occurring as the dregs of a concussion. Dr. Luke Roden attended a boy who, from a most affectionate brother, changed to a malicious tyrant, in consequence of a spicula of bone growing down from the inner surface of a part of the skull which had been depressed by a blow inflicted at school with the end of a ruler. After an operation on the skull by Mr. Cline, which disclosed and removed the source of the evil, the boy's attachment to his brothers returned, and he moreover got rid of a strong Platonic passion which had seized him for a lady, the mother of five children, of whom the eldest was older than himself. A patient of Dr. Gall's was injured by the fall of a tile, which penetrated his brain. It was shortly afterwards remarked that his character had undergone a singular modification. Before the accident he was mild, pacific, and regular in his habits; after it he became eccentric and quarrelsome, flying into a passion on the slightest contradiction.

W. H., about whom I was consulted some time ago, was a steady and respectable tradesman until he fell from some steps while cleaning a shelf in his own shop, and was stunned for a few seconds. From that time he underwent a change. He no longer attended to business to which he had been formerly devoted; he speculated and lost his savings; he manifested antipathy towards his wife and two out of his five children, and he saw his whole family reduced to penury, through his own rashness and neglect, without displaying any compunctions. When complete pecuniary ruin had been effected, he suddenly became himself again, and resumed industrious ways, but ever since he has had attacks of restless excitability, with hatred of his wife and children, twice or thrice a year. He is at all times intelligent, rational, and free from delusions, and when at his best period, joins his relatives in deploring the sad visitations to which he is liable.

Moral delinquency, with its preponderance of the lower feelings and propensities, is also an occasional consequence of cranial injuries; indeed there are grounds for thinking that some who come within the pale of the law as criminals, and who are incorrigible under all correction, have been plunged into vice at first, or have been confirmed in ill-doing, by that cerebral weakness which concussion, and more especially repeated concussion, engenders. A career of dissipation exposes to injuries of the head—these cause a certain amount of weakness and irritability—and these again are enormously aggravated by a continuance in dissipation, so that a total loss of self-control, and an exaggerated activity of all the baser passions is soon reached. Concussion never fails to leave behind it an extreme liability to be powerfully and prejudicially affected by indulgence in wine or any stimulant. The brain that has been severely shaken is intolerant of alcohol in the highest degree, and hence a potation that, previous to the shaking, would have secured only agreeable stimulation, results, after it, in furious delirium or in deep coma. The crippling effects of a cranial injury are, in some cases, never suspected until a little excess demonstrates that the former vigour has departed, and that a condition of weakness and susceptibility has been established. If no error in regimen reveals this state of weakness and susceptibility—this change in the character of cerebral action—an unusual intellectual effort, or some little ailment may betray its presence, for the brain that has sustained an injury, and that after it bears with its wonted ease all ordinary burdens, will often break down lamentably when an extra load is imposed upon it, or when any visceral derangement supervenes. “I never knew that I was damaged,” said a gentleman who had been thrown in the hunting field and had fractured his collar bone and been bewildered for a little, “until we came to balance up, and then I found that contemptible rows of figures baffled me, and that I was not the accountant that I had once been.” Nothing is more sure than that a serious injury in some way enfeebles the cerebrum, and that great caution ought to be observed ever afterwards by anyone who has experienced such an injury.

If we inquire how it is that a serious injury enfeebles the

great nervous centres, and induces changes of character, which are manifested, in order of frequency, 1st, as unusual irascibility and proneness to excitement; 2nd, as moral degradation and vicious tendencies; 3rd, as torpidity and disinclination for exertion; and 4th, as depression and lugubriousness, and which in all these categories fall short of pronounced insanity, and mark only a mental peculiarity or modification compatible with so-called health, but different from the antecedents of the individual—we shall, I think, arrive at the conclusion that some derangement of the vaso-motor nerves of the brain is, in a majority of cases, responsible for the results enumerated. In some few instances, no doubt, minute local extravasations and consequent pathological modifications may adequately account for the phenomena in question, but in a much larger proportion, paresis or irregular action of varying area and persistence of the vaso-motor nerves of the cerebral arteries, can alone explain all the symptoms observed. An injury inflicted on these nerves, or a rupture in the intimate connection subsisting between them and the complex ideational centres, such as is known to be no uncommon accompaniment of concussion, if, indeed, it is not always an integral part of it, is at once sufficient and indispensable, as a common point of origin, for the symptoms already delineated, as well as for others which remain to be mentioned. In many cases in which irascibility and excitement, or periodic wickedness and perversity are manifested after concussion, and in which alcohol acts with energy, disproportioned to the dose, we have also, and at the same time, flushing of the face and neck, darting pains, or a sense of fullness in the head, throbbings in the carotids, suffusion and lacrymation in the eyes, bleeding from the nose, feverishness, restlessness, choreic movements, numbness of the limbs, and excessive thirst. In other cases again, in which dejection or moral deterioration exists, we have pallor of the countenance, dilatation of the pupils, laboured respiration, giddiness, nausea, deafness, dimness of vision, or clonic spasms of muscles. Now, many of these symptoms can be referred only to disorder of the sympathetic nerves and ganglia presiding over the intercranial circulation, and to consequent disturbance in that circulation, and alteration in the calibre of vessels. And it is singular to note that in the first group of

those symptoms we have all those which are present in that paralytic pyrexia, which is so well recognised a feature in the stage of reaction after severe injuries of the head, and which has been incontestably proved to depend upon a temporary paralysis of the vaso-motor nerves. It is reasonable to conclude that that temporary paralysis, which is the immediate result of concussion, may recur from time to time as its secondary consequence, and may induce other kinds of departure from normal action. The fact that those changes of disposition and character, which spring out of cranial injuries, may remain latent as it were, or in a subdued condition for a time, to become active and prominent on the occurrence of any bodily ailment or unusual stimulation, is in itself very suggestive of their vaso-motor origin. It recalls to mind the experiments of Bernard, who remarks that though he has watched, for a length of time, animals who had undergone division of the cervical sympathetic, he has never seen any cedema or inflammatory action supervene in the abnormally hot parts, so long as the animals continued in good health, but if they fell sick, either spontaneously or from the effects of other operations, the mucous membrane of the eye and nose, on the operated side, became very red and swollen, and poured out purulent matter abundantly.

4. *Complete Mental Derangement.*—What has been already said, must have made it clear that cranial injuries may hold an etiological relation to every species of mental defect and disease, and that the full history of their effects upon mental health would be co-extensive with that of insanity. Through every shade of mental abnormality, from a temporary interruption of activity up to total ruin and disintegration, are the consequences of any disturbance or rupture in the great and intricate instrument of the mind, exhibited in certain cases. Every type, form, and variety of alienation may depend, either proximately or remotely, or even through a hereditary chain, upon some violence done to the supreme nervous centres. From a nameless peculiarity of temper up to fierce madness, from the deprivation of a single sense up to the denudation of almost every faculty, there is no phase of derangement which may not have a blow on the head as its starting point. But, this being so, there are



still certain kinds of mental disease which proceed from such an origin, in so much larger a proportion of instances than others, that, as regards them, a more special causal connection seems to be indicated. An examination of a large number of cases of insanity, in the production of which cranial injuries have been concerned, conducts to the conclusion that the destructive consequences of these injuries tend to follow certain great pathological tracts. Certain straggling representatives are to be met with over the whole field of morbid action, but the great bulk of these destructive consequences distinctly pursue a few definite courses. Now what are these pathological tracts or courses in which the majority of the evil consequences of cranial injuries are to be encountered. Not, certainly, those in which the more acute mental diseases abound. Sometimes acute mania or melancholia, or dementia may be traced to concussion or a blow on the head, as a remote or proximate cause, but much oftener they originate in other circumstances and events. Sometimes that diffuse interstitial encephalitis, in which general paralysis essentially consists, is lit up or hastened in its progress by a concussion or blow on the head, but much oftener it, too, owes its commencement and advance to altogether different conditions. The forms of mental disease, which concussion and blows on the head are most active in producing, and in which their effects may be most readily traced, are 1st, Idiocy; 2nd, Recurrent Mania; 3rd, Dementia; 4th, Dementia with Epilepsy; 5th, Senile Dementia; and 6th, Mania e Potû. The registers of the West Riding Asylum bear out these statements. During a period of two years, from the 1st of April, 1870, to the 1st of April, 1872, there were admitted 42 patients, 31 males and 11 females, in whom the influence of cranial injuries, in the production of mental derangement, was clearly shown forth. The histories of these patients were carefully inquired into, and no vague general statements were received.<sup>1</sup> In each case the cranial injury

<sup>1</sup> That caution is necessary in receiving the official statements made when patients are admitted into asylums, may be gathered from some facts communicated with a patient sent here in 1871. This was an old woman, aged 81, a widow, and the mother of a large family, who had lived her long life in the most rational and reputable manner, but regarding whom it was intimated that her insanity, of which this was the first attack, was owing to the circumstance that she was a twin child, and had her head injured at birth.



was proved to have been operative, either in immediately inducing the insanity, or in inaugurating a series of changes which unmistakably led up to it. In a large number of them the injury was not the sole cause of the mental disease, but co-operated with other agencies, but in all of them it was a chief cause or a primary cause, and essential to the result. It is not to be understood that these 42 cases exhaust the evil consequences to mental health, resulting from cranial injuries, which have come under observation in this hospital in the time mentioned. In many other cases, doubtless, which could not be included in this computation, because the information obtained regarding them was imperfect, such injuries conduced to mental overthrow. The cases enumerated are not intended to afford any criterion for judging of the relative frequency of cranial injuries as causes of insanity; they have been collated rather to exhibit the relative frequency of the forms of insanity which cranial injuries most generally induce, and they will best fulfil this object when tabulated as below :—

Form of Mental Disease.	Males.	Females.	Total.
Amentia	...	1	1
Mania, Acute -	1	...	1
„ Puerperal	...	1	1
„ General -	1	1	2
„ Chronic -	1	...	1
„ Recurrent	7	3	10
„ e Potu	2	1	3
Dementia -	8	1	9
„ with Epilepsy	3	2	5
„ Senile -	2	1	3
„ with General Paralysis	3	...	3
Melancholia, Hypochondriacal	3	...	3
Total -	31	11	42

This table, it is believed, fairly represents the relative frequency of the forms of mental aberration which grow out of concussions or injuries of the head, except in the case of amentia. Idiots are detained at their homes or in workhouses, or are boarded out in much larger proportion than the insane, and any comparative calculation therefore, founded upon the

numbers of idiots and lunatics admitted into a county asylum, is necessarily erroneous. Could information be secured as to the causes of the mental defect in all idiots living in any county, it is certain that *amentia* would bulk more largely, in relation to mental diseases, as a consequence of head injuries, than in the above figures. It seems advisable, therefore, in giving illustrative cases of those forms of mental aberration which seem to have a more special connection with concussion or blows on the head, to include an instance of idiocy.

*Amentia*.—E. B., *ætat* 15. Single.—Admitted 15th February, 1872, from Todmorden. When two years old, this girl fell down some steps into a cellar, striking her head violently. After this fall she was in the status epilepticus for three weeks, having dozens of fits in a day, and never altogether recovering consciousness. When the fits passed off she became what is described as “a mad dog,” barking, biting, tearing, and eating any filth that came in her way. During this condition, and for some time after it had given place to greater tranquillity, she was quite deaf and blind, but when about three years old she regained the use of hearing and sight. Before the accident described, she was a healthy vivacious child. No member of her family has ever been insane, epileptic, or paralysed. Since three weeks after the accident she has never had a fit of any kind, but she has grown up idiotic, unable to articulate, ineducable, and very mischievous. Her head is small and conical in shape; it measures  $16\frac{3}{4}$  inches in its greatest circumference, immediately above the eyebrows, 13 inches from ear to ear, across the top, and  $13\frac{1}{2}$  inches from the root of the nose to the occipital spine. The face is narrow. So contracted is the upper jaw, that it cannot accommodate the teeth, which are crowded and displaced. The lateral incisors have never appeared. The palate is highly vaulted. Her figure is stunted, her height being 4 feet 6 inches, but she is not badly formed. Her face wears a bright, good-natured expression. She comes when she is called by name, recognises persons, finds her way about the ward, and understands any simple sentences addressed to her. She never, however, emits any sound or cry even when in anger or pain. She is very curious and is constantly examining objects. She is also acquisitive and steals when she can. She manifests a special taste for fluids, irrespective of their flavour, and will at once drink any beverage that is offered to her.

*Recurrent Mania*.—J. P., *ætat* 48. Married. A weaver, from Dalton.—Re-admitted 8th July, 1871. J. P. is a member of a family in which there has never been any insanity, and was himself of sound mind until about five years ago, when he had a severe blow on the head. Since that occurrence he has been very deaf, and has been liable to outbreaks of mental excitement at irregular intervals. At first these outbreaks consisted merely in causeless anger and restlessness. In April, 1870, however, one of them reached such a pitch as to amount to mania, with delusions and violence to those around him. The maniacal state lasted a fortnight and then passed off, and did not recur until

February, 1871, when, after a few days of depression, he again became excited and so unmanageable that he was sent to this Asylum. He was then restless, talkative, and deluded, alleging that there was something in his head which made a great din and prevented him from hearing; that strange visions haunted him at night, and that a smell of burning brimstone pursued him by day. After six weeks of violence, destructiveness, and incoherence, during which it was necessary for him to sleep in a padded room, he calmed down, became rational, and was discharged recovered on May 10th. On July 8th, he was readmitted in a silly fatuous state, following upon an attack of mania, which had been preceded by a few days of depression, and in which all his former delusions had returned. From the fatuity he slowly recovered, but since then he has passed through two maniacal paroxysms, beginning August 8th, 1871, and January 14th, 1872, both characterised by the same delusions, both preceded by a brief stage of melancholy, and both of about the same duration. He is desperately violent when excited, and menaces all who approach him. Suspicion seems to be uppermost in his mind, and his ravings are about conspiracies and persecutions of which he is the victim. There is a good deal of turgesence of the features at the outset of the maniacal attacks.

*Mania e Potû.*—J. P., ætat. 59. Married. A cab driver, from Barnsley.—Admitted 13th March, 1872. He has been of very intemperate habits for many years, but has never suffered from insanity or delirium tremens until last Christmas, when he fell from a hearse, being drunk at the time, and sustained an extensive scalp wound. After that he passed at once into a state resembling delirium tremens, but more prolonged. He was restless, agitated, sleepless, saw visions, attempted to destroy himself, and trembled very much. Thus he has continued since. For five days before admission to this Asylum he was in the Barnsley Union Workhouse, and there it took four men to restrain him. When admitted he was stupid and restless; his voice was tremulous and husky; his hands were shaky, and his tongue was thickly furred. During the night he was out of bed and very noisy. On March 16th, after much sub-acute excitement, he quickly became comatose and could not be roused. Sinapisms were applied to the calves of the legs, and sherry was administered in small repeated doses, and, under this treatment, he rallied and recovered consciousness in twelve hours. Subsequent to the coma, there was no return of the excitement, but a state of morose indifference subsisted for some weeks. This, too, gradually vanished, and the patient is now convalescent and awaiting discharge.

*Dementia with Brain Wasting.*—N. N., ætat. 43. Married. A tanner, from Doncaster.—Admitted 29th December, 1871. He was a steady, temperate, hard-working and healthy man until ten weeks ago, when he fell backwards into a tan-pit, when at work, and sustained a severe blow on the head, and a shock to his system generally. After being taken out of the pit, he was able to walk home, but his wife noticed a gradually progressive change in him from that hour. He was not so quick in apprehension as formerly, and grew sullen and despondent. Shortly he announced that he was ruined, and that he should cut his throat. He did actually attempt to drown himself. His deportment towards his family was entirely changed, so that instead of manifesting affection he showed dislike

to all his relatives, and was violent towards his wife. On admission it was noticed that his attention wandered, that he was occasionally a little confused, and that his prevailing tone of feeling was gloomy. His countenance was heavy, and without any fine lines of expression, his complexion was singularly pale and pasty, and all his muscles were slightly unsteady in their actions. The pupils of the eyes were equal, but sluggish in movement, and the tongue was pale, flabby, and tremulous when protruded. He was fairly nourished, but the muscles were soft and flaccid. There seemed to be some slight degree of anæsthesia of the hands. The pulse was 84, and the heart sounds were feeble and indistinct. Cod liver oil and hypophosphite of soda were ordered, and these he has since continued to take. His mental power has slightly failed since his admission, but he has had no delusions nor excitement. He can still talk intelligently upon various topics. His muscular power has failed greatly. On the 3rd of May he suffered a slight stroke, and has since been partially paralysed on the left side. His features are dull and heavy. He droops to the left side when he walks, and sways to and fro when he endeavours to stand still unsupported. His hands are tremulous, and he complains of muscular pains in all his limbs. His pupils are dilated and his skin singularly pale. He presents in short, in a marked manner, the symptoms of brain wasting which evidently commenced with the concussion. There is no history of nervous disease in his family. His mother died at 81 years of age, and his father, who is upwards of 90, is still alive.

*Dementia with Epilepsy.*—E. A. W., ætat. 30. Married.—Admitted 25th October, 1870, from Halifax. She has been epileptic since she was ten years of age, when she fell out of a swing and injured her forehead. She has been always a little weak-minded, irritable, and peculiar, but these traits did not prevent her from being married. Since her marriage she has had six children, of whom four have died of convulsions. The youngest child was born eight weeks previous to her removal to this Asylum. During her pregnancy she had been exceedingly stupid, and, after her confinement, she became restless and unmanageable. Since she became an inmate of the Asylum, she has become gradually more fatuous, has suffered from frequent fits, most numerous during the night and at her monthly periods, and has, indeed, been kept alive by stimulants, Bromide of Potassium, and Ergot of Rye. She cannot now stand alone, but rolls about helplessly in an easy-chair. When spoken to, she raises herself, utters a few incoherent words, and then falls back. From time to time she shrieks out loud, harsh, meaningless cries, and tosses her arms clumsily about her head. She suffers from fits, which occur very often and affect both sides, and leave her comatose for half-an-hour. She is very thin, her complexion is dusky and bloated, and she has not menstruated for several months. She is, in short, fast sinking through the last stage of epileptic dementia towards its fatal termination.

*Senile Dementia.*—E. B., ætat. 74. Married. Housewife, from Poute fract. —Admitted 26th July, 1870. She is the mother of seven children, the youngest of whom is 43 years old, and has all her life enjoyed singularly robust health, never having suffered from any ailment more serious than rheumatic pains. Up to January, 1870, she gave no indications of dotage, her intelligence and



senses remaining as clear and active as ever. At that time, however, she fell and hurt her head, and was at once plunged into senile decrepitude. She complained of headache, which troubled her day and night, so a medical man was called in and applied leeches which gave her some relief. She could not remember the days of the week, began to wander away from home without any purpose, neglected her household duties, and became filthy and abusive in her language. On admission she was in a state of mental bewilderment, mistaking strangers for her relations, and fancying that the ward was a street in her native town. Her memory was a wreck, and she was sleepless and restless during the night. She was much emaciated, very pale, and all her muscles were tremulous. There was no *circulus adiposus* nor cording of vessels. Great difficulty was experienced in getting her to take sufficient food. Having continued in a state of senile dementia, and having become gradually thinner and more helpless, in October, 1870, icterus showed itself. This continued until her death, on December 23rd. At the autopsy the skull was found to be of average thickness, but unsymmetrical, being longer on the left, and broader on the right side. There was no thickening of the membranes, but extreme wasting of the convolutions of the frontal and parietal lobes, with gaping of the sulci between them. A large quantity of serum escaped during the removal of the brain. The cineritious substance was pale, and the medullary of a dirty white colour, but normal consistence. There was also schirrus of the head of the pancreas, and a large cyst with fluid contents, and thick fibrous walls in the left lobe of the liver.

*Hypochondriacal Melancholia.*—T. H. S., ætat. 38. Married. A painter, from Huddersfield.—Admitted 23rd March, 1872. Six years ago he received a violent wound from a shovel, the scar of which is still visible on his forehead. Having been previously a cheerful, rather sanguine man, he became low-spirited after the accident, and worried himself about the state of his health. His anxiety on that score gradually increased, until he came to fancy that he suffered from serious disease. Ever since the injury to the head he has been the victim of melancholy, and of fancies respecting his bodily condition. At times he has suffered from exacerbations, in which he has been acutely distressed and has threatened suicide. During one of these exacerbations he was sent to the Newcastle Borough Lunatic Asylum, where he remained some time. In his search after health he has consulted numerous medical men, read various medical works, and has visited America for change of air. He now maintains that he labours under spermatorrhœa, and that his brain and bowels are incurably diseased. He is very dejected, and broods perpetually upon his own infirmities, about which also he is most desirous of conversing. He sleeps badly, and is disturbed by dreams of fire and trouble and alarm. He feels light and giddy in the head, and often experiences pain in and around the seat of the injury of the head, where there is a distinct flattening of the bone, and a white depressed cicatrix three inches in length. There is a trifling convergent strabismus affecting the left eye. He suffers much from coldness of the feet. Notwithstanding that he partakes liberally of nourishment, he is losing flesh, and is altogether very wretched in mind and body. Two courses of treatment which have been tried have not secured any alleviation.



# PUERPERAL MANIA.

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THE insanity of puerperal women appears under two great types, melancholia and mania. It is regarding mania that this paper treats; the chief objects of the writer being the consideration of its etiology and treatment; to which will be appended the statistics of the disease as met with and treated in the West Riding Asylum. The frequency of this form of disease is indicated by the fact that out of a total of 13,748 deliveries, 26 women were affected by it immediately after delivery, a ratio, therefore, of 1 to 528 (Johnston and Sinclair's 'Practical Midwifery'). Mania, affecting puerperal and pregnant females, is one of the most curable forms of insanity. There is, perhaps, no disease of the mind in which more favourable results can be obtained by immediate treatment: hence the supreme importance of the ordinary obstetric attendant recognising the earliest symptoms, and being able to treat with promptitude those forewarnings that generally occur.

The painful character of the delusions, and the scrupulous care with which the persons affected have to be guarded, in consequence of suicidal and homicidal impulses, in many cases, compel an early separation from friends; and should not the premonitory symptoms yield to treatment almost immediately, the most humane plan is to have the patient removed

to fresh scenes, and, if necessary, purer air, with a special attendant, or to recommend removal to an asylum. Too much stress cannot be laid on the great importance of prompt measures, not necessarily heroic, in these cases. Most authorities speak very decidedly on this point; and every one at all conversant with the insomnia, accompanied by restlessness, irritation of manner, foul tongue, and other signs that generally usher in an attack, is aware of the beneficial, and, in some cases, curative influence of an emetic, a purgative, an anodyne, or other drug under such circumstances.

The varieties of mania which occur during or after pregnancy are, by most writers, described as three, the ground of such classification being the time of the first occurrence of the insanity. In the first variety, that occurring during the pregnant condition, the period at which the attack may commence is variable. Dr. John B. Tuke concludes, from his experience, that the majority of the attacks occur at those periods of utero-gestation which are generally considered critical, viz., the third, fifth, and seventh months. This form of puerperal mania is the most favourable, as statistics show, and may be considered along with another variety which is transient, and which occurs during parturition. Some few women suffer from a passing form of alienation when the pains are most acute, either when the os-uteri is at full stretch, or when the head is emerging from the vagina. This form can hardly be classed as a separate one, nor placed correctly under any other, as it is more properly speaking a delirium of agony, ceasing as soon as the intense pain which causes the delirium has passed away. In case 2 (reported below) although there was no absolute raving, yet when the head was, by means of the forceps, being drawn through the external orifice, the patient looked about her for some half-minute, with a scared bewildered glance, and her talk was incoherent and spiteful to those around her. As soon as the extreme pain had passed away, she was perfectly rational and thankful to her friends for their assistance.

The second form of mania, which might be called "true puerperal mania," is the most frequent, and occurs during the first month after delivery. Most of the cases of this form commence in the first fortnight, and, although it is not so

favourable as that occurring during pregnancy, yet the recoveries are very numerous, and take place in much less time than the average duration of other kinds of insanity.

The third and last variety is that occurring during lactation. In this, as in the first form, a long period has to be given during which an attack may be feared; the periods most fertile in cases are the second, third, eleventh, and twelfth months after confinement, and, if suckling is carried to any longer period, the chances increase in greater ratio. There is also great risk, according to statistics, when a mother suddenly weans a child, although, at these later periods, the form of insanity is more frequently melancholia than mania. Pathologists of the early part of the present century were quite content to attribute cases occurring under such circumstances to metastasis of milk to the brain, due to the sudden suppression of the lacteal secretion. Dr. Gooch attacks this view in his treatise, and points out that mothers in fashionable circles, not suckling their own offspring, allow the milk to be secreted and to be re-absorbed, and the natural tendency to secretion to pass away without evil results, and this is usually accomplished within a few days of the confinement, at a time when the mother is most susceptible, and is not followed by any untoward result.

The following cases have occurred in private practice, and as they are of some interest in connection with this subject a full report is given of each. Unmistakable symptoms of the approach of puerperal mania were present in both, and, although recovery was rapid, yet it is probable that had the treatment been less prompt the results would not have proved so satisfactory:—

CASE 1.—Mrs. N., *ætat.* 43.—Previous history : She has had several children (6?) the eldest of whom is about 19. She never has had an attack of a like nature before. During the recovery from her first confinement she had to be moved from her bed about the third day after, and transported over the roof of her house to another, in consequence of a fire. This was followed by no untoward mental symptoms. Her last child was born 7 years ago.—April, 1871. About four days after her present labour, which was a somewhat protracted one, she was noticed to be restless and anxious, more especially about the suckling of her infant. The pulse was frequent, the skin hot, the bowels had not acted, milk had not begun to flow, and the lochia were scanty in quantity and offensive in odour.

The next day she was worse in every respect, the tongue furred, and the restlessness much increased; she had hardly slept at all during the night. The temperature was about 102. She was ordered a purgative of Castor Oil and Turpentine, and considerable doses of *Liq. Ammon. Acet.*

The sixth day, the temperature was the same, the pulse quick (about 120), expression of face anxious, and manner excited. She had delusions about her husband trying to poison her, and would not take food in consequence. As she made some attempts to injure her infant it was kept away from her. The dose and frequency of the *Liq. Ammon. Acet.* were increased, and a purgative of Calomel was administered, the bowels not having been opened. The lochia being scanty and offensive frequent injections were ordered of warm water and Condyl's fluid. Beef tea, wine, eggs, and milk were given as diet, and a night draught of Morphia.

Seventh day, the bowels had acted freely, she had slept tolerably, and was much more composed; the pulse was still quick, and the temperature high (101). Four minim doses of the Tincture of Aconite added to her mixture. The delusions were less marked, and her expression of face was more at ease; her conversation was more sober and rational. The opiate was repeated.

The next day, the patient had slept well, was sane in mind, cool in skin, with a quieter pulse, and after this made a rapid recovery.

CASE 2.—Mrs. B., ætat. 23.—February, 1872: She was delivered of her first child by forceps, after 36 hours' labour. There was no difficulty in the delivery, but she was becoming very much exhausted when the forceps were applied and delivery was accomplished in a few minutes, a very large male child being brought living into the world. The bandage was put on carefully, the uterus contracted fairly, and a full dose of Ergot was administered.

The second day after delivery, the patient had a quick pulse, and complained of some after-pains; as the lochia were deficient, the parts were ordered to be syringed out with warm water.

The third day, the pulse was thin but quick (above 100), the skin was moist but hot, and the expression of her face was anxious and pained. The bowels had not been opened, there was no milk in the breasts, and the lochia were very scanty and offensive. She was ordered an ounce of Castor Oil, the vagina to be well syringed out with Condyl's fluid and warm water.

The fourth day, the patient, as regards bodily symptoms, was the same; the lochia were intensely disagreeable in odour, the breasts were still hard and painful, but without sign of milk, the tongue was whitish, and the bowels were still obstinate. Her mind had been wandering all night, and she was restless and excited, talking irrationally and frequently about her husband and child. The child had to be separated from her, as she made several attempts to suffocate it when put to the breasts. A purgative of Castor Oil ordered at mid-day, and, as the condition was similar at night, an injection of Castor Oil and gruel was given, and a draught consisting of Sulphate of Magnesia, Senna, and Jalap administered by the mouth.

The next morning the bowels were opened freely twice, and a large clot was discharged from the vagina. When seen the febrile symptoms had almost disappeared, and, although confused in her recollections of the last 36 hours, she was rational. She made a rapid recovery after this.

Dr. Forbes Winslow has called attention to the stage of incubation. It is during this variable period that treatment is of so much avail.

As in most cases there is a period of incubation, so, also, is there a period, after the cessation of the maniacal ravings of dementia. In some cases this is so marked that it becomes a question for the medical practitioner whether the patient will ever regain her intellect, and he may be sufficiently impressed with the gravity or prolongation of this demented condition to give a hopeless prognosis of the case in point. The recoveries are so numerous, even after a long period of apathy, that great caution should be observed in the opinion given as to the ultimate recovery of any patient. In a large number of cases attacked by this disease, the early symptoms are those of some toxæmia, the pulse is quick, not full, perhaps reaching 120 per minute, the tongue is furred and white, the temperature is raised, the flow of milk, if established, stops, the lochial discharge, if immediately after labour, is either suppressed or scanty and offensive in character, as Dr. Braxton Hicks says,<sup>1</sup> "Certainly the larger number were affected with the local symptoms first, and about eight out of ten had offensive lochia." This state is unconnected with albumen in the urine, and although this fluid is generally high coloured from lithates, yet not rarely the urine is almost of average quantity and normal constituents.

The late Sir J. Y. Simpson has alluded to this form of the disease,<sup>2</sup> and has suggested, as an almost universal law of causation, that the poisonous material is connected with uræmic poisoning. He mentions cases that have occurred in his practice, in all of which there was either a temporary state of albuminous urine during the early stage, or a permanent complication of a like nature. While we cannot regard this as a universal law, there is undoubtedly a certain percentage of cases in which albuminous urine is present; and in not a few the state of kidney secretion is to such a degree interfered with, that eclampsia occurs at the labour, which is followed, in a very short time, by an attack of mania; and the appearance of albumen in the urine in cases of eclampsia has

<sup>1</sup> 'Obstit. Trans.,' vol. xii., p. 63.

<sup>2</sup> Vol. iii. of 'Collected Works.'



been sufficiently noted to be regarded as almost invariable, and as the cause of the convulsions occurring at the parturient period.

Numerous other sources of blood poisoning may exist at this time, the lochia may become offensive in consequence of some retained shreds of membrane or decomposing clot, and the bowels or skin may not act in the accustomed healthy manner. When we have superadded to this the peculiarly susceptible condition of the patient, we have the conditions necessary for the establishment of the disease.

The writer would not assert that all cases are due either to what might be called septicæmic or uræmic poisoning, but that a considerable number of cases are thus caused. Dr. Gooch, in his admirable treatise on this form of disease already alluded to, relates a case in which his treatment consisted in "a dose of Calomel and Jalap, followed by small doses of Sulphate of Magnesia," and, in three days' time, the condition of the patient being the same, he ordered a "strong dose of Senna and Salts, made more active by the addition of Tincture of Jalap. After this had been taken about three hours it procured a very large evacuation, nearly black and horribly offensive. This was, as usual, discharged into the bed, without any notice on the part of the patient. It acted again an hour or two afterwards, but now the nurse, who was sitting by the bedside, was surprised to see her turn round and in a calm and natural manner request to be taken up as her medicine was going to operate. Her waistcoat was immediately loosened, and she was taken out of bed when she voided a stool of prodigious size, as dark and offensive as the first, and then walked back to her bed calm and collected.

\* \* \* She recovered rapidly and uninterruptedly."

In another case, this author calls attention to the facts that the patient had jaundice at the time of her first confinement and became maniacal, that she had a slight degree of it during her second confinement, and suffered the same disease; that she was completely jaundiced before her third confinement; that it was removed by purgatives before labour; and that she this time escaped any mental derangement.

In the cases which form the basis of this paper, there are three which show indubitably in their histories some poisonous material in the blood; one is a case in which pneumonia set

in shortly after admission, and, as soon as the pneumonic exudation had become absorbed, the recovery was quick and without interruption. The other two cases had prolonged and well marked attacks of septicæmia. During the whole time that the septicæmic condition was present they remained insane, but as soon as the morbid poison had exhausted itself they recovered more or less rapidly.

The condition of body that predisposes to an attack of septicæmic mania is one sometimes met with in ordinary practice. An individual who consumes large quantities of nitrogenous food, but is not sufficiently careful about the condition of the bowels and the state of the skin, sometimes suffers from an accumulation, as it were, of effete material in the blood. This gives rise to a state often called feverish cold, the symptoms of which are quick pulse, foul tongue, clammy hot skin, loss of appetite and frequently sore throat, pains in the limbs, and even rigors. This condition rapidly gives way under the administration of a mixture of Sulphate of Magnesia and Sulphate of Iron with Sulphuric Acid or Diaphoretics and Diuretics, and, in conjunction with both, the free use of the warm bath, whereby the whole secretory system is stimulated, and the blood becomes of normal constitution.

In cases that are complicated with albumen in the urine, if the experience gained at the West Riding Asylum is of any value, the prognosis is bad, as all the patients who came into the Asylum with this complication died.

Another variety of this disease is brought on solely by some mental shock, and this is generally in women who are remarkable for their nervous temperament, the peculiar circumstances under which they were suffering evidently having some predisposing effect. In many cases that have been related in Journals and elsewhere, parturient women have been going on in a satisfactory manner until the receipt of news, greatly affecting them in some way, almost immediately they rave and become maniacal. Then set in many delusions as to identity, as to the plans and intrigues of those around; then follow the characteristic obscene and lewd expressions from even the most virtuous and well-educated women.

Other conditions, besides those above enumerated, have some

influence in the causation of this disease. In some cases, a protracted and troublesome labour seems to have a definite effect in inducing an attack, whilst the loss of unusual quantities of blood at the labour also tends in the same direction.

In the West Riding Asylum, cases of true puerperal mania (*i.e.*, those occurring during the month after parturition) are classified under three heads, from the nature of the cause, Nervous, Anæmic, and Toxic.

The nervous cases are numerous. When we consider how susceptible the weaker sex is at all times during the period of fecundity, but more especially when the sexual organs are in action, we shall hardly be surprised that cases of mania occur after or during the time when the whole vital force of the patient has been directed to the formation and nourishment of the foetus in utero. In arranging under the different heads the various predisposing and other causes, the prolific one of hereditary taint would necessarily come under consideration here. Esquirol is of opinion that insanity is the most hereditary of all diseases. It seems reasonable that a woman, predisposed by inheritance to insanity, should be more susceptible to any excitement than another in whom no such taint exists. According to various authorities as many as 40 or 50 per cent. of the cases attacked, exhibit some hereditary predisposition. In the 76 women who have been admitted into the West Riding Asylum, suffering from this disease during the last  $3\frac{1}{2}$  years, a family history of insanity can be ascertained to exist only in a very small per centage, but this is probably owing to the histories being rarely complete.

Females, who have previously had attacks of insanity, are liable after the disturbing influence of a pregnancy or parturition without any other cause to have another attack, whilst those who suffer at or subsequent to any pregnancy, are ten fold more liable in after labours.

Dr. Crichton Browne is of opinion that the swarthy complexioned and dark haired women, when affected with this disease, are much longer before they recover, and also that the after period of dementia is much more prolonged in them than in the fair haired. It will help our prognosis very much if this proves to be the fact; in the cases that the writer

has collected from the books of the asylum, this opinion is well established, most of the women, who resided for any length of time without improvement, being correctly described by the term swarthy.

Those cases due to anæmia are not so numerous amongst puerperal women as in those who are suckling, exhaustion caused by too prolonged lactation, reducing the woman to a state almost identical with that seen in those who have lost large quantities of blood. The anæmia, induced by the above causes, may be compared to the condition seen in patients who are dying from some exhausting disease, in the last stage of which, the occurrence of delirium is almost invariable.

The next cause has been spoken of at some length already. The special poison that induces the morbid brain action is supposed to be accumulated excrementitious material. The late Sir J. Y. Simpson says:—<sup>1</sup>

“But when the whole constitution and chemistry of the blood becomes deranged and altered by the sudden accumulation of the excrementitious materials of the urine within it, as is always liable to happen in puerperal albuminaria, other organic toxicological agents may become developed within the system from the decomposing urea, or other components of the urine, possibly some of these newly formed products or agents of an alkaloidal character, and one or other of which may be as certain of exciting delirium and insanity as an overdose of morphia, or brucine, or other poisonous vegetable alkaloids is certain of exciting their special toxicological effect upon the economy. In the blood of the puerperal females, greatly modified as it is in the normal states of pregnancy and delivery, and containing as it does after parturition the effete elements of the involving or disintegrating uterus, and the material for the new lacteal secretion, ferments and agents may possibly exist which are more apt to develop special morbid poisons out of retained renal excretion than happens in other states of the system.”

The argument here used by so high an authority may be well applied to other forms of deficient elimination where the urine does not contain albumen. There are cases in the West Riding

<sup>1</sup> Vol. iii., p. 365, of ‘Collected Works.’

Asylum that well illustrated the view here stated; the following is a well marked one: Mrs. W. was a patient during 1869 and 1870, and her usual conduct was decorous, and conversation rational; she busied herself contentedly during her sane and lucid intervals in the laundry. Every six weeks she had an attack of the most violent mania, biting, and tearing, and raving in a loud voice on quickly changing and incongruous subjects. As she was a very strong woman, she proved herself a very troublesome patient. All her attacks succumbed to an eliminative plan of treatment; an emetic was first administered, shortly after which, a cathartic of a somewhat drastic character was ordered, and in 36 hours the patient was passing through the usual period of apathy previous to a perfect recovery from the attack. The frequency of these attacks was much lessened by a suitable purgative taken occasionally; during the last 12 months of her residence at the asylum, she did not have a single attack of mania, her freedom from such attacks being due to a dose of Castor Oil at regular intervals. In this case the causation of the disease is not far to seek, the constipation was a sufficient irritation to give rise to the mental derangement; as an argument it is a powerful one that not only uræmic poisoning but other pent up secretions have a tendency to cause maniacal disturbance.

Dr. Gooch (Page 125, 'Diseases of Women') states, "We have no power by medicinal agents of relieving a disordered mind, except indirectly through the disorder of the body with which it is connected. It is impossible therefore to stir one step in the treatment of the disease without first ascertaining what this disorder is; or, if different in different cases, what they are, how to discriminate them, and whether experience shows that one is more common than another."

In asylum practice the patients rarely come under observation until they have passed the stage wherein eliminants are useful, but it will tend to the recovery of many if appropriate treatment be applied in the early stages.

#### TREATMENT.

The treatment of insanity on the true principles of scientific therapeutics has only lately been pursued by our alienist



physicians, and, although no specific remedies have been discovered which invariably control the perverted ideas of the insane and rectify the morbid cerebral action, yet the advance made on the old views (which were founded on erroneous opinions as to the pathology of affections of the mind) is unmistakable, and fresh observations are being made daily in our large asylums as to the effect of the various remedies on the human brain in its abnormal conditions. It is to be hoped that great results may accrue from the laborious work done in such institutions.

The treatment adopted in former centuries is described at length by Sir J. Y. Simpson (3rd vol. of 'Collected Works'), while that in use at the early part of the present century was, at the West Riding Asylum, but slightly different from that described.

The use of the sleeves (strait waistcoat) was almost universal in the management of the maniacal, whilst that method of treatment would seem in our time cruel and unjustifiable. Cold shower baths, general and local bleedings, of more or less severity were frequent, and the usual depletory remedies in general use for other diseases were used indiscriminately for mania of all kinds, under the general impression that insanity was the result of congestion or inflammation of the brain and its membranes. Another method that was occasionally adopted for maniacal patients, and, it is to be hoped, was not tried for puerperal women, was the "surprise bath." This consisted of a perfectly dark room, with a trap in the floor. The patient being turned loose into this chamber wandered about excitedly until the floor suddenly seemed to give way under his feet, and he was immediately in cold water up to his arm-pits. The attendants, waiting at the door, were ready, as soon as this happened, to come to the assistance and rescue of the terrified patient. The recoveries under this system of treatment must have been few and the deaths numerous.

In reading over the cases reported by Dr. Gooch, one cannot but be appalled not only at the frequency and prodigious quantity of the bleedings, but also at the too often fatal result of those cases. All honour be to Dr. Gooch, who used his powerful influence in first exposing the fallacy of this once

popular practice, and who laid the foundation for a more rational and judicious system of treatment.

At a later period bleeding and other means of depletion disappeared, while the opposite plan was adopted, good nourishing food, separation from friends and quietude, helped by various medicaments, being almost universally adopted. Statistics prove the wisdom of the change, deaths are now infrequent, recoveries are very numerous.

Of the cases admitted into this Asylum during the last three years and a half, only 1 out of 73 women, affected with puerperal mania, is in such a state as to justify a hopeless prognosis. Take, to compare with that, the period of two years and a half from Aug., 1834. Ten cases out of 267 admissions were puerperal, the results being 4 died, 3 recovered and were discharged in a fairly average time, the other 3 were discharged at the request of their friends (not recovered). One of these had to be re-admitted in three weeks, remained in the asylum for years, and was sent out at last in the same condition.

In passing in review the various remedies that are in use in puerperal mania, but little will be stated except a resumé of the results of the different modes of treatment adopted in the West Riding Asylum.

*Purgatives and Emetics.*—In the early part of this paper sufficient stress has been laid on the great benefit of the administration of these two kinds of drugs, but it is unusual for the patients to be admitted at an early enough stage to try the effect of these remedies, except as adjuncts to other medicines. The great value of purgatives in the stage pointed out is insisted upon by most authorities, and the use of emetics is also considered of immense benefit. No particular purgative has much advantage over others, and it is at the option of the medical attendant as to which he prescribes.

*Diaphoretics and Diuretics* are of great value also in the toxic variety. The warm bath is a useful remedy, in regard to its diaphoretic properties. Moreover, it seems to have, in some cases, a special calming effect on the patient.

*Anodynes* are of immense benefit in many, more particularly the nervous cases, as, by relieving the insomnia alone, a great step is taken towards recovery. Discrimination is very necessary in the administration of this class of medicines, as, in some few cases, the maniacal disturbance is rather increased than relieved by them. Again, under their use the condition of the bowels should be carefully watched. Of these remedies, Opium, and its active principle, Morphia, are mostly in use. The dose has generally to be very large to produce its soporific effect, 20 or 40 minims of Tincture or Sedative Solution of Opium, or a quarter or half a grain of Morphia, is a fair dose in such cases.

*Hydrate of Chloral* is a most valuable remedy. It may be given in a 30 grain doses at night, and care should be taken that the condition of the patient, after taking it, is, as regards the surroundings, that of absolute quietude. The continuance of this drug is attended by many dangers, and, although a most potent ally when given in single doses, yet it may prove a most dangerous remedy when continued for any length of time.

*Hyoscyamus* is of little value if given in ordinary doses, it should, if tried, be administered in two drachm doses of the Tincture.

*Camphor* is but seldom used, although, according to numerous writers, much good may be expected from its employment. It may be used as a night draught, or, in smaller doses, repeated frequently in the day for its calmative effect. Five or ten grains, in the form of pills, may be given for a single dose; two or four grains may be tried three or four times a day, with every hope of benefit.

*Conium* has been used with great advantage in many cases under treatment lately. When given continuously, it speedily develops a quieter and more healthy state of mind. The dose of this remedy should be  $\frac{1}{6}$  —  $\frac{1}{3}$  of a grain of Conia, or 3 ij —  $\frac{3}{4}$  ss of the Succus Conii.

*Bromide of Potassium* is one of the most valuable remedies used in this form of mania, especially in the true puerperal

occurring within the month of parturition. Its action, in the healthy state, upon the organic functions is acknowledged, and in this form of insanity, in which the principal topic of the rambling talk is connected either directly or indirectly with the generative functions, the remedy seems to have great power in controlling the lewd discourse and erotic desires of the puerperal maniac. It is, perhaps, most useful in the nervous variety of the disease, and may be given to induce sleep or to moderate excitement. Twenty grains may be given three times a day, or the dose may be doubled for a night draught.

*Tonics* should be used in most cases of insanity from lactation, and the best form is perhaps the Tincture of the Perchloride of Iron ; it assists the recovery of the patients who are exsanguine, either from too prolonged or exhausting lactation, or from profuse hemorrhage during or after labour. The treatment of these patients is altogether incomplete unless great care is taken that they have sufficient food. Should it be refused, it must be administered in liquid form by the stomach tube. If the refusal of food, and the consequent use of artificial feeding are continued for a long period, the ultimate termination of the case becomes a matter of grave doubt.

Many recoveries are reported after some powerful mental impression ; one case is deserving of record.

E. H. R. had a prolonged and tedious labour in March, 1869, and, subsequent to the delivery of the child, inversion of the uterus seems to have taken place ; however she went on very well for a few days, but was then observed to have the usual premonitory signs, such as quick pulse, restless manner, and offensive lochia, and these symptoms gradually merged into puerperal mania. She was kept at home for eleven weeks, during which time she was perfectly unmanageable. In making the journey from her home to the asylum, the excitement was even increased, and she had to be held to prevent her from leaping out of the cab. Immediately on her admission to the ward she became perfectly calm and rational, she never had a relapse, and was discharged after the usual probationary period of about two months.

## STATISTICS.

The period taken is from Oct. 10th, 1869, to May 10th in the present year (1872). During this time (3 years and 6 months) there have been 889 admissions on the female side. Of this number 76 have been puerperal cases.

These 76 attacks have affected 73 women, but in the statistics they will rank separately as 76 attacks.

The death rate is very small, 4 of the whole number died (1 in 19), and the cause of death in each case was some complication.

CASE 1.—Died from enteric fever five months after admission, while convalescent.

CASE 2.—Was admitted suffering from Bright's disease. She was very anæmic and much exhausted. Every effort was made to avoid the result feared at the time of admission. Stimulants and feeding, and even transfusion, were had recourse to, but they all failed and the patient died on the second day after admission. At the post-mortem examination the kidneys showed all the signs of extensive and long existing degeneration.

CASE 3.—Suffered from Bright's disease. She died in six weeks after admission. The diagnosis was verified by post-mortem examination.

CASE 4.—Died the day after admission. The previous history of this case showed almost complete abstinence from nutritious food for several days, but free indulgence in alcohol for some time previous to her admission. The post-mortem examination revealed the cause of death to be ulceration of the mucous membrane of the small intestines, and, during the examination, the room was pervaded with a very strong smell of turpentine. The friends afterwards admitted that it was probable that the patient had, during one of the paroxysms of excitement, drunk off a quantity of turpentine.

The 76 attacks terminated thus, 4 in death, 65 in recovery, and have left the asylum (12 in three months, 34 in six months, 12 in nine months, 3 in twelve months, and 4 in more than twelve months), 6 are still in progress towards convalescence, and 1 only is still without any hopes of ultimate recovery. She has been in for upwards of two years and is now quite demented, but has occasional attacks of maniacal excitement of great violence, which are only controlled by a combination of *Cannabis Indica* and Bromide of Potassium.

In the whole number, 55 are the first attack, 10 second attack, 2 third attack, 6 have had at least one attack previously, 2 were "strange in conduct," after all previous pregnancies, 1 is noted



as having been "excited after all her childbirths." Of the 10 who were suffering from the second attack 4 were after the second labour in women who had suffered at the previous (or first labour), 1 admitted at her third labour had been maniacal after her first confinement. Of those admitted during the third attack of this malady, 2 were after the third confinement in patients who had been similarly affected at each of the two previous parturitions; 1 who came after the fourth confinement had suffered after the second and third.

The labour at which the mental disturbance took place is as follows:—

- 18 after the first labour.
- 14 after the second labour.
- 9 after the third labour.
- 10 after the fourth labour.
- 6 after the fifth labour.
- 5 after the sixth labour.
- 2 after the seventh labour.
- 2 after the eighth labour.
- 1 after each of the ninth and eleventh labours.
- 8 not stated at what labour.

This is not in conformity with other writers' statistics; the small number of attacks after the first labour, in proportion to those occurring in after confinements is conspicuous; but this noticeable variation disappears when we arrange the women and not the attacks under this head: and only take the first attack in each woman. The following is then the result.

- 25 after the first labour.
- 12 after the second labour.
- 7 after the third labour.
- 9 after the fourth labour.
- and the rest but little altered.

The ages at which the attacks took place are

- At 18 years of age there was 1
- „ 19 „ „ were 2

At 21 years of age there were	5
„ 22 „ „ „	2
„ 23 „ „ „	3
„ 24 „ „ „	7
„ 25 „ „ „	5
„ 26 „ „ „	6
„ 27 „ „ „	3
„ 28 „ „ „	6
„ 29 „ „ „	4
„ 30 „ „ „	2
„ 31 „ „ was	1
„ 32 „ „ were	3
„ 33 „ „ „	5
„ 34 „ „ was	1
„ 35 „ „ were	7
„ 36 „ „ „	3
„ 37 „ „ „	4
„ 38 „ „ was	1
„ 39 „ „ „	1
„ 40 „ „ „	1
„ 42 „ „ were	2
Not stated at what age	1

The number of attacks in periods of five years.

Under 20 years there were	3 attacks.
From 21 to 25 years of age there were	22
„ 26 „ 30 „ „ „	21
„ 31 „ 35 „ „ „	17
„ 36 „ 40 „ „ „	9
Above 40 „ „ „	3
Not stated	1

The condition of patients as regards marriage is—62 were married, 7 were single, 3 widows, 1 not stated. In two of the married women the children were illegitimate.

Of the 76 attacks, 9 occurred during pregnancy, almost all during the latter two months, and the majority during the last few weeks. In this division amongst 9 patients, 1 died

1 recovered in less than three months, 6 were discharged in less than six months, and 1 was discharged in seven months. These occurred as follows, 3 during the second pregnancy, 2 during the third, 1 at each of the fourth, fifth, seventh, and ninth pregnancies, and the ages were 4 under and 5 about thirty.

Of the remaining 67 attacks, 38 (exactly one half of the total number) occurred during the first four weeks after labour with the following results.

2 of these died (Cases 2 and 3).

5 recovered and were discharged in less than 3 months.

14	"	"	"	"	6	"
6	"	"	"	"	9	"
3	"	"	"	"	12	"
3	"	"	"	more than	12	"
3 are still in the asylum but convalescent.						
2	"	"	"	"	improved.	

The labour at which these attacks occurred was as follows:—

13 took place after the first labour

8	"	"	second	"
2	"	"	third	"
4	"	"	fourth	"
1	"	"	fifth	"
2	"	"	sixth	"
1	"	"	seventh and eighth labour	
7	not stated			

The ages of the women when these attacks took place were—

	Under 20	there were	3
From	21 to 25	„ „	16
„	26 „ 30	„ „	11
„	31 „ 35	„ „	2
„	36 „ 40	„ „	5
	Not stated		1

The average period at home in a state of mania of these 38

Cases is a little more than 4 weeks, the average total period of insanity was  $5\frac{1}{2}$  months.

The labour is noted in the histories to have been complicated by flooding or tediousness in 6 cases (one being a cross birth), in 4 convulsions were present at labour; in 2 the after treatment was complicated by a syphilitic history.

The cases of puerperal mania occurring during lactation were 29 in number. Of these 1 died, 27 recovered, (6 in three months, 12 in six months, 5 in nine months, 1 more than twelve months, 3 are still in but convalescent), and 1, before alluded to, is still in the Asylum, unimproved in mental condition, and likely to remain so all her life. The labours after which the patients had the attack were

5	after first labour.
4	„ second „
5	„ third „
5	„ fourth „
4	„ fifth „
3	„ sixth „
1	„ both eighth and eleventh labour
1	not stated

The length of time during which lactation was carried on before insanity set in, varied from 6 weeks to 21 months, the average being a little more than 6 months.

The ages of those who suffered from this form of disease compare remarkably with those in whom insanity occurred immediately after labour, the number in this variety being far greater at a later period than in the preceding variety.

6 women whose ages range from 22 to 25 inclusive.					
6	„	„	„	26	„ 30 „
12	„	„	„	31	„ 35 „
3	„	„	„	36	„ 40 „
2	„	„	range above 40		

The average period at home in an insane condition equals nearly 6 weeks, while the average total period of insanity is  $4\frac{1}{2}$  months.

In the above statistics, the cases of mania are taken to the exclusion of those of melancholia, hence the apparent small percentage of puerperal cases (about 1 in 12).

It will be seen how favourable the issue of the cases has been in comparison with other forms of mental disease, both in regard to the death rate and to the number and rapidity of the recoveries: no deaths occurred from the disease uncomplicated by other serious visceral lesions.

The treatment in one third of the cases was tonic, whilst almost invariably extra diet was ordered, and in many cases wine or brandy was given.



A NEW METHOD  
OF  
DETERMINING THE DEPTH OF THE GREY MATTER  
OF THE  
CEREBRAL CONVOLUTIONS.

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ON reviewing what has been done in the investigation of the cortical substance of the human brain, in its healthy and in its morbid state, with reference to that great function which we know it to exercise, one cannot help being struck by the fact that although much has been done, and vast is the store of accumulated facts which have, especially of late years, been amassed, much has yet to be discovered.

On entering on this subject, facts and observations are not wanting which seem, at first sight, to point to a definite conclusion; but in whatever direction we may have advanced, and however pleasant the path may seem, there comes a check to further progress; it may be soon or it may be late, but almost invariably it does come. It is so in the physiology of the brain, and it is the same in its morbid anatomy.

With respect to the healthy brain, few questions have arisen having a deeper interest than those, the object of which is to ascertain to what extent the degree of intellect possessed by an individual during life may be estimated by an examination of the brain after death. As yet this inquiry has been limited chiefly to a consideration of size, weight, and general conformation. The point has been very fully brought out by the researches of Wayner and others, and is a conclusion which we

can scarcely avoid, that, as a general rule, great intellectual power is associated with a large and heavy brain; and on the other hand, that in the lower races of mankind, in whom the intellect is less highly cultivated, a smaller and less perfectly developed organ is usually found. Unfortunately however, this is by no means an invariable rule, for instances are not wanting in which the brain representing superior intellect has not only not surpassed another, lower in the intellectual scale, but has even fallen below it. Exceptions of this nature differ from those which belong to rules in general; for here we cannot be content to have the fact, and as such, accept it without further inquiry. However numerous the instances in which the rule, as previously stated, holds good, if we admit the fact of an exception, it is for us to explain how such an exception may arise; and if we are unable to do this, we must confess, that other conditions of whose nature we are ignorant, may exist and play an important part.

In the second place, the number and depth of the cerebral convolutions have called forth special attention; for here also, as with respect to size, it has been found that increased depth and number of the convolutions coincides, in many instances, with superior intellectual power. But here again, having arrived at a general conclusion, based on observations which are good and true, we are met by the stern fact that this is not always so, and that instances are not wanting in which the exact opposite has been the case. These are instances in which the difficulty comes late; a general conclusion is arrived at, but is marred by exceptions which we are unable to explain.

But with regard to the grey cortical layer, other questions besides that of extent demand consideration. In histology considerable strides have of late years, and are still being made, chiefly owing to the excellence of modern instruments and improved methods of research. But although we are now enabled to study the minute structure of the nervous system with considerable accuracy, and although the grey matter of the human cerebrum has been the subject of extensive and elaborate investigation, when the question arises as to the difference histologically between two brains, one of which represents a high, the other a low standard of intellect, we are

compelled to admit that the answer to the question lies beyond our reach.

The specific gravity of the cortical layer has of late been the subject of careful consideration, but as yet I am not aware that differences have been detected corresponding with gradations in mental capacity.

Passing now to the consideration of the brain in its pathological condition, however true it may be that there is usually found after death, some condition or conditions which are most assuredly abnormal, and which we can, to a certain extent, connect with morbid processes present during life; yet it is also true that cases may, and do occur when we find ourselves at fault, when either all our methods of observation fail to elicit anything abnormal, or when there is a seeming contradiction given to those views which experience has shown, in the majority of cases, to be correct.

From these considerations it follows that we may have presented to us for examination two brains, equal in size and weight; equal also, so far as can be ascertained, in the number and depth of the convolutions—that is to say, in the extent of the grey matter, the latter being also similar in its minute structure; and yet one may represent great intellectual power, the other quite an opposite condition. Further still, it may occur that a brain, in a morbid state, presents characters not to be distinguished from those in health. It is in such cases as these that we feel the force of the fact, that however important those conditions which we can appreciate may be, others exist, of the nature of which we are still ignorant; and that, while at it were digging deeper in the old channels with those materials which we already possess, no opportunity should be neglected of bringing others to bear, and by their means striking out new channels of investigation, further and further elucidate and estimate the importance of those points on which our knowledge is still deficient.

It will be observed that, in the course of these remarks, no observation has been made with reference to the depth of the grey matter of the convolutions, and this brings me more immediately to the subject of my paper. I am not aware that any extensive and accurate observations have been made in

order to ascertain the exact depth of the cortical layer, and yet the importance of such an inquiry, whether in a physiological<sup>1</sup> or in a pathological point of view, can scarcely be questioned. It is, I think, quite possible that by a closer inquiry into this point we may find a solution of the difficulty, and an explanation of some of those troublesome exceptions to which I formerly referred. For example, in cases in which *a priori* one would expect to find differences in size and in the number and depth of the convolutions, and yet no such difference can be detected, I think it quite possible, and even probable, that accurate measurement would demonstrate a variation in the depth of the cortical layer, and if this could be proved, the exception would be satisfactorily accounted for, and the difficulty, I conceive, removed. It may be that I am wrong in this, and that actual experience may show the impracticability of demonstrating a difference of such nicety; but when we pass out of the region of health into that of disease, there can be no doubt, as I hope to show, that differences do exist in this respect; and such being the case, I see no reason why variations should not occur, although it may be to a very slight extent, under normal circumstances; and in any case, if this be probable, or even only possible, it is well worthy of our closest and most searching inquiry.

It had been observed, during the course of an investigation with the specific gravity of the brain,

1st. That in the same organ the depth of the grey matter varied considerably in different situations, and

2nd. That in different brains the relative depth in corresponding situations seemed to differ.

The question now arose—By what means could the thickness of the cortical substance be readily and accurately measured? the desideratum being an instrument, which should enable the operator to combine ease and rapidity with accuracy of investigation. I may say shortly, that, with this object in view, I was led to devise an instrument which I have called the Tephrylometer<sup>1</sup> (τεφρά ash coloured, ὕλη matter), and which, I venture to think, fulfils the required conditions; and

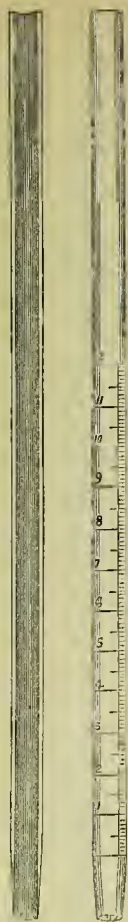
<sup>1</sup> For the suggestion of this word I am indebted to the kindness of Dr. James P. Steele.

it will now be my endeavour, in the first place, to explain its construction; in the second place, the method of using it; and lastly to adduce a few results which, by its means, have been obtained.

The peculiarity of the instrument consists in its extreme simplicity. It is nothing more than a graduated glass tube, open at both extremities. Its length, as I now use it, is five inches. This however is merely an arbitrary standard. The first I used was only four inches in length, and answered the purpose very well. On the whole, however, I am inclined to think the five inch measurement preferable. The wall of the tube is in thickness about equal to that of a goose quill, or a little thicker, except for about a quarter of an inch at one extremity, where it is bevelled off in such a manner, that this end of the tube presents an orifice surrounded by a smooth and tolerably sharp margin. At the opposite extremity, the tube wall retains its usual thickness, not being in any way bevelled off. The graduation, which is on a fiftieth of an inch scale, extends over half the length of the instrument, commencing at a distance of a quarter of an inch from the piercing or bevelled off extremity. The graduated lines are made black so as to show out more distinctly, and each fifth degree, that is to say every tenth inch mark, is longer and more conspicuous than the intermediate ones. The bore of the tube is everywhere of uniform size, and this is a point of all importance; for should the calibre at all diminish at the piercing extremity, the instrument is worthless. The *wall* of the tube should taper, the *calibre* must not. The above description applies to all sizes of instrument, the point on which they differ, viz., the diameter of the bore, not having been considered. At present I am in the habit of using three sizes, which I call respectively Nos. 1, 2, and 3. No. 1 is the largest; in it the diameter of the bore measures eight fiftieths of an inch; in No. 2 it is six fiftieths, and in No. 3 five fiftieths. The necessity, or at least the advisability, of having different sizes will be explained hereafter.

The following drawings represents No. 1 instrument, and an examination of them will at once explain any points which my description may have failed to make clear:—





B

A

Before considering the more special *modus operandi*, there are two points which claim attention. The first has reference to the preparation of the brain. It is essential that the organ should be stripped thoroughly and completely of its Pia-mater. This in most cases is a matter of no difficulty, but on the other hand, may be exceedingly troublesome to accomplish. There are two chief conditions which may prove a source of difficulty. The first is extreme tenuity and delicacy of the membrane, which exists to a greater or less extent in all healthy brains, and is also met with, though exceptionally, associated with a morbid condition of that organ. This condition demands care and patience on the part of the operator. Should much trouble be experienced, the process should be carried on under water, as by this means the delicate pieces of Pia-mater are floated up, and can be removed with greater facility.

The second source of difficulty is more serious. I refer to the presence of adhesion between the Pia-mater and the subjacent cortical substance. It may be so slight as to present little or no opposition to the stripping process; but on the other hand, the adhesions may be so firm and dense as to render removal of the membrane, without injury to the brain substance, a matter of the utmost difficulty or even impossibility. For such cases I must at once admit, my method is not suited. It is difficult indeed to conceive any method, by means of which, under these circumstances, the measurements could be fully carried out; for to any process, the presence of adhesion must offer a very serious impediment. To such an extent, however, it is exceptional; in general, when present, it is slight or moderate in amount, and demands—as in the cases before referred to, in which the

Figure A represents the instrument *in situ*.

Figure B the same, on longitudinal section.

membrane is unusually fine—a proportionate amount of patience and care. In all cases, after the stripping process is complete, the brain should be slightly washed in water, so as to remove blood, &c., the presence of which, by clouding the instrument, would tend to obscure the observations.

The second point I wish to notice has reference to the size of instrument to be employed. It need scarcely be said that the size of a frontal or parietal convolution is considerably greater than that of an occipital; and now the object of having tubes of different sizes will be evident; for an instrument which serves very well for the former, will be too large for the latter. It may be urged, and very reasonably, that an instrument adapted to the smaller convolutions should be equally so to the larger; nevertheless, experience on the whole, has led me to prefer the larger tubes when possible; I must admit however that it is not essential.

Having now fixed on the convolution, the grey matter of which it is desired to estimate, take the instrument selected between the ring and middle fingers and the thumb of the right hand, and, holding it vertically to the surface of the convolution, and with the sharp extremity downwards, pierce the convolution as nearly as possible in the middle line, making the instrument bury itself, to about half its length, in the cerebral substance. This movement may, with a little practice, be performed with great rapidity and precision; as a rule however, I prefer to do it more slowly, imparting to the instrument as it penetrates the grey matter, a slight rotatory motion, so as to facilitate its passage; but in any case when the cortical substance has been traversed, the movement should be completed somewhat rapidly. By this, which constitutes *the first movement*, the cerebral substance is pierced, and passes into the interior of the instrument during the downward progress of the latter.

The second movement now follows, and is thus performed:—Still holding the tube as before directed, the right forefinger is made to descend so as to close the projecting orifice; and in order to effect this more completely, it is desirable that the pulp of the forefinger should be moist, for on the thorough closure of this orifice everything depends. This constitutes the *second movement*, and by it as will be at once apparent, one change

only is brought about, viz., the conversion of an open into a closed tube.

The *third movement* consists simply in the withdrawal of the entire tube, the hand being retained in exactly the same relation to the instrument as in the previous movement. The direction of the long axis of the tube should, as far as possible, be retained throughout all three movements.

There corresponds to this movement—

1st. Commencing withdrawal of the tube.

2nd. Formation of a vacuum within the tube.

3rd. Rupture of the cerebral white matter at the lower orifice.

4th. Complete withdrawal of the instrument.

It will be at once seen that these movements are of the simplest kind, and essentially they never vary. As regards some of the secondary points however, such as the position of the fingers in the first movement, although I have stated that the middle and ring fingers of the right hand should be made to oppose the thumb, it is right I should add that it is not a point of much consequence. The fore and middle fingers or the forefinger only, may be used with the thumb, the only disadvantage being that a little additional movement of the right forefinger is rendered necessary; this however is rather a theoretical than a practical objection. When possible, it is always best to pierce downwards; but in some situations this cannot easily be done, and in the latter case the position of the fingers may conveniently be varied to meet the convenience of the operator.

With regard to the third movement, it should be performed somewhat suddenly and rapidly, as by so doing the cerebral white matter is ruptured with greater certainty.

The above directions having been properly carried out, on examination of the instrument, its lower part will be found occupied by cerebral substance, the grey portion of which is distinctly seen and must now be measured. This is done by holding the tube in such a position that the graduation may be in full view, when nothing remains but to read off the number of fiftieths of an inch occupied by the grey matter of the specimen.

In reading off the number of degrees, I am in the habit of using a lens—any ordinary pocket lens answers the purpose perfectly. It is not by any means essential to the process, still, after having worked for some time, the eye is apt to become somewhat fatigued, and this I find is altogether obviated by the use of a low magnifying power.

Having now completed the observation, it is necessary to clear the instrument previous to repeating the process. This is effected by blowing through the tube, by which means the contained substance is projected, leaving the instrument slightly hazy. This haziness is at once and completely removed by dipping the end for a second or two in water, a glass of which fluid should be placed conveniently for the purpose. The piece of cerebral substance so discharged retains its form perfectly, and may be kept if desired for further examination, being blown into spirit or other preservative.

The whole process as above described, may, with a little practice, be performed very rapidly. I have myself frequently recorded an observation, and prepared the instrument for the next, within thirteen seconds; but this is of course needlessly quick, and could not be repeated often in succession, without greatly endangering that accuracy, which in this, as in all other investigations of like nature, is of the last importance.

It may be well to notice here a source of error against which it is necessary to guard in making these observations. It was formerly stated that care should be taken to pierce the convolution as nearly as possible in the middle line. The reason for this will be evident when the structure of a convolution is considered; for if this point be not attended to, the piercing tube will encounter and include part of the grey matter forming the lateral boundary of the convolution, and the result will be, that the portion of grey matter within the tube, instead of being uniform in thickness, will be uneven, and deeper at one part of the circumference of the tube than at another. It is on this account that I prefer to perform the first movement, in part at least, somewhat slowly; and more especially is this precaution advisable when the smaller convolutions, such as those of the occipital lobes, are under examination; in any case, however, due regard being paid to this point, and

care being taken to select the instrument in accordance with the size of the convolution to be pierced, this source of error will not occur.

I now pass to consider the mode of procedure in estimating the *average* depth of the cortical substance, in all or any of the convolutions. Little however need be added to those general directions which I have already given; for the method I adopt will at once be understood, on referring to the examples I have recorded. I do not consider it sufficient to take one specimen from any convolution, and to attempt therefrom to draw a conclusion; but I take several measurements, varying in number according to the size of the convolution, and then ascertain the mean depth of grey matter in the specimens so taken. It is however a question of interest, and one which I have not as yet determined, how far the depth of any one specimen will represent the *average* depth in the convolution from which it was taken. The Cerebellum should not be removed, unless required for other purposes; for it serves to steady the brain, and to prop up the posterior lobes, and thus considerably facilitates the process in this situation. I usually commence at the frontal convolutions and proceed in regular order backwards; first finishing the upper surface of one hemisphere before commencing the other. This is not a point of great importance, still it must be remembered that the brain in its recent state, especially when deprived of its Pia-mater, is always soft, and any unnecessary handling is to be avoided. For the same reason I always finish the upper surface of both hemispheres previous to commencing at the base. It is a point of some advantage to have a list of the various convolutions drawn out before hand, with a space opposite each for recording the numbers. In many cases it is not possible to have assistance, and I do not think it necessary, care being taken to render each step as simple as possible. It need scarcely be said that the process I have described, if fully carried out, is one of some length. It cannot be otherwise when the examination of a single brain comprises upwards of 220 distinct observations. But the question is not whether the absolute amount of time required be considerable, but rather, if it is disproportionate to the importance of the question to be determined. The answer to this question must, I think, be in the negative.



The following tables represent the examination of the brain, as conducted on the principles I have laid down, in four cases. The numbers in each case which correspond to the individual convolutions, represent accurately the measurements taken; but in estimating the depth of the grey matter in the various lobes and groups of convolutions, the numbers are given approximately, very minute fractions (of a fiftieth of an inch) not being considered:—

## BRAIN OF J. M. H. S. (ACUTE MANIA).

Depth of Grey matter (in 50ths of an inch).

Convolutions.	Right Hemisphere.	Mean Depth	Left Hemisphere.	Mean Depth
1st Frontal... ..	6.6.5.5.5.5.	$\frac{5\frac{1}{2}}{50}$	6.6.5.6.6.5.	$\frac{5\frac{1}{2}}{50}$
2nd „ ... ..	5.5.5.5.5.6.	$\frac{5\frac{1}{2}}{50}$	5.5.5.6.5.5.	$\frac{5\frac{1}{2}}{50}$
3rd „ ... ..	6.6.5.7.5.5.	$\frac{5\frac{3}{4}}{50}$	6.6.5.6.5.5.	$\frac{5\frac{1}{2}}{50}$
Ascending Frontal ... ..	6.6.6.6.6.5.	$\frac{6}{50}$	6.6.6.7.6.6.	$\frac{6\frac{1}{2}}{50}$
„ Parietal ... ..	5.5.5.5.5.5.	$\frac{5}{50}$	5.5.6.5.6.5.	$\frac{5\frac{1}{2}}{50}$
Postero-parietal Lobule ... ..	6.5.5.5.	$\frac{5\frac{1}{2}}{50}$	5.5.5.5.	$\frac{5}{50}$
Supra Marginal Conv. ... ..	6.6.6.7.	$\frac{6\frac{1}{2}}{50}$	5.6.6.5.	$\frac{5\frac{1}{2}}{50}$
Angular Conv. ... ..	6.5.5.5.	$\frac{5\frac{1}{2}}{50}$	6.6.5.5.	$\frac{5\frac{1}{2}}{50}$
1st Annectant Conv. ... ..	5.5.5.	$\frac{5}{50}$	5.5.5.	$\frac{5}{50}$
2nd „ „ ... ..	5.6.6.	$\frac{5\frac{1}{2}}{50}$	6.6.5.	$\frac{5\frac{1}{2}}{50}$
3rd „ „ ... ..	5.5.6.	$\frac{5\frac{1}{2}}{50}$	5.5.5.	$\frac{5}{50}$
Superior Occipital ... ..	4.4.4.	$\frac{4}{50}$	4.5.5.	$\frac{4\frac{3}{4}}{50}$
Middle „ ... ..	4.4.4.	$\frac{4}{50}$	5.4.4.	$\frac{4\frac{1}{2}}{50}$
Inferior „ ... ..	5.4.4.	$\frac{4\frac{1}{2}}{50}$	5.4.4.	$\frac{4\frac{1}{2}}{50}$
Supr.-temporal Sphenoidal ... ..	6.6.6.6.	$\frac{6}{50}$	5.6.6.5.	$\frac{5\frac{1}{2}}{50}$
Middle „ „ ... ..	6.5.5.6.	$\frac{5\frac{1}{2}}{50}$	6.5.6.5.	$\frac{5\frac{1}{2}}{50}$
Inferior „ „ ... ..	5.5.5.6.	$\frac{5\frac{1}{2}}{50}$	5.6.6.5.	$\frac{5\frac{1}{2}}{50}$
Orbital Lobe, Marginal Conv. ... ..	4.4.4.	$\frac{4}{50}$	4.4.4.	$\frac{4}{50}$
„ „ Internal „ ... ..	5.4.4.	$\frac{4\frac{1}{2}}{50}$	5.4.4.	$\frac{4\frac{1}{2}}{50}$
„ „ External „ ... ..	5.5.5.	$\frac{5}{50}$	5.5.4.	$\frac{4\frac{3}{4}}{50}$
„ „ Posterior „ ... ..	4.5.4.	$\frac{4\frac{1}{2}}{50}$	6.6.4.	$\frac{5\frac{1}{2}}{50}$
Central Lobe, Antr. Conv. ... ..	7.7.	$\frac{7}{50}$	6.6.	$\frac{6}{50}$
„ „ Middle „ ... ..	6.6.	$\frac{6}{50}$	7.5.	$\frac{6}{50}$
„ „ Posterior „ ... ..	6.5.	$\frac{5\frac{1}{2}}{60}$	6.5.	$\frac{5\frac{1}{2}}{50}$
Marginal Convolution ... ..	5.5.5.5.	$\frac{5}{50}$	5.5.5.4.	$\frac{4\frac{3}{4}}{50}$
Gyrus Fornicatus ... ..	5.5.5.5.	$\frac{5}{50}$	5.5.6.	$\frac{5\frac{1}{2}}{50}$
Quadrilateral Lobule ... ..	5.5.6.	$\frac{5\frac{1}{2}}{50}$	4.4.5.	$\frac{4\frac{1}{2}}{50}$
Cuneato Lobe ... ..	5.4.3.	$\frac{4}{50}$	4.3.4.	$\frac{3\frac{3}{4}}{50}$
Uncinate Gyrus ... ..	3.4.3.	$\frac{3\frac{1}{2}}{50}$	3.4.4.	$\frac{3\frac{3}{4}}{50}$
Internal Temporal Convolutions	4.4.4.5.	$\frac{4\frac{1}{2}}{50}$	5.5.5.5.	$\frac{5}{50}$

## BRAIN OF J. B. (SENILE DEMENTIA).

Depth of Grey Matter (in 50ths of an inch).

Convolutions.	Right Hemisphere.	Mean Depth	Left Hemisphere.	Mean Depth
1st Frontal .. .. .	5.7.6.6.7.5.	$\frac{6}{50}$	6.6.7.5.6.5.	$\frac{6}{50}$
2nd ,, ... ..	5.6.6.5.6.4.	$\frac{5\frac{1}{2}}{50}$	5.6.5.6.5.5.	$\frac{5\frac{1}{2}}{50}$
3rd ,, ... ..	6.6.4.5.6.5.	$\frac{5\frac{1}{2}}{50}$	5.5.5.5.4.5.	$\frac{5}{50}$
Ascending Frontal ... ..	6.6.5.6.7.5.	$\frac{6}{50}$	5.6.6.6.5.6.	$\frac{5\frac{2}{3}}{50}$
,, Parietal ... ..	5.5.5.5.5.5.	$\frac{5}{50}$	5.5.5.4.5.4.	$\frac{4\frac{2}{3}}{50}$
Postero-parietal Lobule ... ..	5.5.5.	$\frac{5}{50}$	5.6.5.	$\frac{5\frac{1}{2}}{50}$
Supra Marginal Conv. ... ..	4.4.5.	$\frac{4\frac{2}{3}}{50}$	5.5.5.	$\frac{5}{50}$
Angular Conv. ... ..	6.5.	$\frac{5\frac{1}{2}}{50}$	6.5.	$\frac{5\frac{1}{2}}{50}$
1st Annectant Conv. ... ..	4.4.	$\frac{4}{50}$	5.4.	$\frac{4\frac{1}{2}}{50}$
2nd ,, ,, ... ..	5.5.4.	$\frac{4\frac{2}{3}}{50}$	6.5.5.	$\frac{5\frac{1}{2}}{50}$
3rd ,, ,, ... ..	4.5.5.	$\frac{4\frac{2}{3}}{50}$	4.4.5.	$\frac{4\frac{1}{2}}{50}$
Superior Occipital ... ..	4.3.3.	$\frac{3\frac{1}{2}}{50}$	4.3.3.	$\frac{3\frac{1}{2}}{50}$
Middle ,, ... ..	4.4.3.	$\frac{3\frac{2}{3}}{50}$	4.4.3.	$\frac{3\frac{2}{3}}{50}$
Inferior ,, ... ..	4.4.3.	$\frac{3\frac{2}{3}}{50}$	4.5.4.	$\frac{4\frac{1}{2}}{50}$
Temp. Sphenoid Lobe Sup. Conv.	5.5.5.5.5.	$\frac{5}{50}$	6.4.5.5.5.	$\frac{5}{50}$
,, ,, ,, Middle ,,	5.5.5.4.5.	$\frac{4\frac{1}{2}}{50}$	6.5.5.4.4.	$\frac{4\frac{1}{2}}{50}$
,, ,, ,, Inferior,,	5.5.5.4.4.	$\frac{4\frac{1}{2}}{50}$	4.4.5.4.4.	$\frac{4\frac{1}{2}}{50}$
Orbital Lobe, Marginal Conv. ...	4.3.4.	$\frac{3\frac{2}{3}}{50}$	4.4.3.	$\frac{3\frac{2}{3}}{50}$
,, ,, Internal ,, ...	3.4.4.	$\frac{3\frac{2}{3}}{50}$	4.4.4.	$\frac{4}{50}$
,, ,, External ,, ...	3.3.3.	$\frac{3}{50}$	4.4.4.	$\frac{4}{50}$
,, ,, Posterior ,, ...	5.5.4.	$\frac{4\frac{2}{3}}{50}$	4.4.4.	$\frac{4}{50}$
Central Lobe, Antr. Conv. ...	6.6.	$\frac{6}{50}$	7.6.	$\frac{6\frac{1}{2}}{50}$
,, ,, Middle ,, ...	6.5.	$\frac{5\frac{1}{2}}{50}$	5.6.	$\frac{5\frac{1}{2}}{50}$
,, ,, Posterior Conv. ...	4.5.	$\frac{4\frac{1}{2}}{50}$	4.6.	$\frac{5}{50}$
Marginal Convolution ... ..	5.5.6.	$\frac{5\frac{1}{2}}{50}$	5.6.6.	$\frac{5\frac{2}{3}}{50}$
Gyrus Fornicatus ... ..	5.5.5.	$\frac{5}{50}$	5.5.5.	$\frac{5}{50}$
Quadrilateral Lobule ... ..	5.4.5.	$\frac{4\frac{2}{3}}{50}$	5.5.5.	$\frac{5}{50}$
Cuneate Lobe ... ..	3.4.3.	$\frac{3\frac{1}{2}}{50}$	4.4.4.	$\frac{4}{50}$
Uncinate Gyrus ... ..	4.4.3.	$\frac{3\frac{2}{3}}{50}$	3.4.3.	$\frac{3\frac{1}{2}}{50}$
Internal Temporal Convolutions	5.5.5.5.4.4.	$\frac{4\frac{2}{3}}{50}$	6.5.4.5.4.4.	$\frac{4\frac{2}{3}}{50}$

BRAIN OF J. M. H. S. (ACUTE MANIA) *Continued.*

Relative depth in the various Lobes and Groups of Convolutions.

	Right Hemisphere.	Left Hemisphere.
Frontal Lobe ... ..	$\frac{5\frac{1}{2}}{50}$	$\frac{6}{50}$
Parietal ,, ... ..	$\frac{5\frac{1}{2}}{50}$	$\frac{5\frac{1}{2}}{50}$
Annectant Gyri ... ..	$\frac{5}{50}$	$\frac{5}{50}$
Occipital Lobe .. ...	$\frac{4}{50}$	$\frac{4\frac{1}{2}}{50}$
Temporo-Sphenoidal Lobe ... ..	$\frac{5\frac{1}{2}}{50}$	$\frac{5\frac{1}{2}}{50}$
Orbital Lobe ... ..	$\frac{4\frac{1}{2}}{50}$	$\frac{4\frac{1}{2}}{50}$
Central ,, ... ..	$\frac{6}{50}$	$\frac{6}{50}$
Marginal Convolution, Gyrus Fornicatus, } Quadrilateral Lobule ... .. }	$\frac{5}{50}$	$\frac{5}{50}$
Cuneate Lobe, Uncinate Gyrus ... ..	$\frac{3\frac{2}{3}}{50}$	$\frac{3\frac{2}{3}}{50}$
Internal Temporals ... ..	$\frac{4\frac{1}{2}}{50}$	$\frac{5}{50}$
The Hemispheres ... ..	$\frac{5}{50}$	$\frac{5}{50}$
Average depth of the whole Cortical substance, = a little over $\frac{1}{10}$ inch.		

BRAIN OF J. B. (SENILE DEMENTIA) *Continued.*

Relative depth in the various Groups of Convolutions.

	Right Hemisphere.	Left Hemisphere.
Frontal Lobe ... ..	$\frac{6}{50}$	$\frac{5\frac{1}{2}}{50}$
Parietal ,, ... ..	$\frac{5}{50}$	$\frac{5}{50}$
Annectant Gyri ... ..	$\frac{4\frac{1}{2}}{50}$	$\frac{5}{50}$
Occipital Lobe ... ..	$\frac{4}{50}$	$\frac{4}{50}$
Temporo-Sphenoidal ... ..	$\frac{5}{50}$	$\frac{5}{50}$
Orbital Lobe ... ..	$\frac{4}{50}$	$\frac{4}{50}$
Central ,, ... ..	$\frac{5\frac{1}{2}}{50}$	$\frac{6}{50}$
Marginal Convolutions, Gyrus Fornicatus, } Quadrilateral Lobule ... .. }	$\frac{5}{50}$	$\frac{5}{50}$
Cuneate Lobe, Uncinate Gyrus ... ..	$\frac{3\frac{1}{2}}{50}$	$\frac{3\frac{1}{2}}{50}$
Internal Temporals ... ..	$\frac{5}{50}$	$\frac{5}{50}$
The Hemispheres ... ..	$\frac{5}{50}$	$\frac{5}{50}$
Average depth of the whole Cortical Substance = $\frac{1}{10}$ inch.		

BRAIN OF J. J. (SENILE DEMENTIA).

Depth of Grey matter (in 50ths of an inch).

Convolutions.	Right Hemisphere.	Mean Depth	Left Hemisphere.	Mean Depth
1st Frontal... ..	5.5.6.6.6.5.	$\frac{5\frac{1}{2}}{50}$	6.6.5.6.6.5.	$\frac{5\frac{2}{3}}{50}$
2nd „ ... ..	6.6.7.6.5.5.	$\frac{6}{50}$	6.6.5.5.5.5.	$\frac{5\frac{1}{3}}{50}$
3rd „ ... ..	5.5.5.5.4.5.	$\frac{5\frac{2}{3}}{50}$	5.6.5.5.5.5.	$\frac{5}{50}$
Ascending Frontal ... ..	5.6.6.6.6.5.	$\frac{5\frac{2}{3}}{50}$	5.6.6.6.6.5.	$\frac{5\frac{2}{3}}{50}$
„ Parietal ... ..	5.5.5.5.5.5.	$\frac{5}{50}$	5.5.5.5.5.5.	$\frac{5}{50}$
Postero-parietal Lobule ... ..	6.5.4.	$\frac{5}{50}$	4.5.5.	$\frac{4\frac{2}{3}}{50}$
Supra Marginal Conv. ... ..	5.5.5.	$\frac{5}{50}$	5.6.5.	$\frac{5\frac{1}{3}}{50}$
Angular Conv. ... ..	4.5.5.	$\frac{4\frac{2}{3}}{50}$	4.5.5.	$\frac{4\frac{2}{3}}{50}$
1st Annectant Conv. ... ..	4.4.4.	$\frac{4}{50}$	5.4.5.	$\frac{4\frac{2}{3}}{50}$
2nd „ „ ... ..	5.5.6.	$\frac{5\frac{1}{3}}{50}$	4.4.4.	$\frac{4}{50}$
3rd „ „ ... ..	5.4.4.	$\frac{4\frac{1}{3}}{50}$	5.4.4.	$\frac{4\frac{1}{3}}{50}$
Supr. Occipital ... ..	5.4.4.	$\frac{4\frac{1}{3}}{50}$	4.4.5.	$\frac{4\frac{1}{3}}{50}$
Middle „ ... ..	5.4.4.	$\frac{4\frac{1}{3}}{50}$	4.4.4.	$\frac{4}{50}$
Inferior „ ... ..	4.5.5.	$\frac{4\frac{2}{3}}{50}$	4.4.4.	$\frac{4}{50}$
Supr. Temp. Sphenoidal... ..	5.5.5.	$\frac{5}{50}$	5.5.5.	$\frac{5}{50}$
Middle „ „ ... ..	5.5.5.	$\frac{5}{50}$	4.5.5.	$\frac{4\frac{2}{3}}{50}$
Inferior „ „ ... ..	5.4.4.	$\frac{4\frac{1}{3}}{50}$	5.4.5.	$\frac{4\frac{2}{3}}{50}$
Orbital Lobe, Marginal Conv. ... ..	4.3.3.	$\frac{3\frac{1}{3}}{50}$	4.3.3.	$\frac{3\frac{1}{3}}{50}$
„ „ Internal „ ... ..	4.3.3.	$\frac{3\frac{1}{3}}{50}$	4.4.3.	$\frac{3\frac{2}{3}}{50}$
„ „ External „ ... ..	4.4.4.	$\frac{4}{50}$	4.3.4.	$\frac{3\frac{2}{3}}{50}$
„ „ Posterior „ ... ..	4.4.4.	$\frac{4}{50}$	3.4.4.	$\frac{3\frac{2}{3}}{50}$
Central Lobe, Antr. Gyrus ... ..	4.4.	$\frac{4}{50}$	5.5.	$\frac{5}{50}$
„ „ Middle ... ..	4.5.	$\frac{4\frac{1}{2}}{50}$	5.5.	$\frac{5}{50}$
„ „ Posterior ... ..	3.4.	$\frac{3\frac{1}{2}}{50}$	5.5.	$\frac{5}{50}$
Marginal Convolution ... ..	5.5.5.4.	$\frac{4\frac{3}{4}}{50}$	5.5.5.4.	$\frac{4\frac{3}{4}}{50}$
Gyrus Fornicatus ... ..	4.4.4.	$\frac{4}{50}$	4.4.4.	$\frac{4}{50}$
Quadrilateral Lobule ... ..	4.5.4.	$\frac{4\frac{1}{2}}{50}$	4.5.4.	$\frac{4\frac{1}{2}}{50}$
Cuneate Lobe ... ..	5.4.4.	$\frac{4\frac{1}{3}}{50}$	3.3.4.	$\frac{3\frac{1}{3}}{50}$
Uncinate Gyrus ... ..	3.3.4.	$\frac{3\frac{1}{3}}{50}$	3.3.3.	$\frac{3}{50}$
Internal Temporal Convolutions	4.3.4.	$\frac{4}{50}$	5.4.4.	$\frac{4\frac{1}{3}}{50}$



## BRAIN OF M. B. (CHRONIC MANIA).

Depth of Grey matter (in 50ths of an inch).

Convolutions.	Right Hemisphere.	Mean Depth	Left Hemisphere.	Mean Depth
1st Frontal... ..	6.6.5.6.5.4.	$\frac{5\frac{1}{2}}{50}$	6.6.5.5.5.5.	$\frac{5\frac{1}{2}}{50}$
2nd „ „ „ „	5.6.5.5.4.5.	$\frac{5}{50}$	5.5.5.4.4.4.	$\frac{4\frac{1}{2}}{50}$
3rd „ „ „ „	4.4.5.5.	$\frac{4\frac{1}{2}}{50}$	5.4.5.5.	$\frac{4\frac{3}{4}}{50}$
Ascending Frontal „ „	6.5.5.6.5.5.	$\frac{5\frac{1}{2}}{50}$	6.6.5.5.6.4.	$\frac{5\frac{1}{2}}{50}$
„ Parietal „ „	5.6.5.5.5.4.	$\frac{5}{50}$	4.5.5.5.6.5.	$\frac{5}{50}$
Postero-parietal Lobule „ „	5.5.5.5.	$\frac{5}{50}$	5.5.5.5.	$\frac{5}{50}$
Supra Marginal Conv. „ „	5.5.4.5.	$\frac{4\frac{3}{4}}{50}$	5.5.6.5.	$\frac{5\frac{1}{4}}{50}$
Angular Conv. „ „	5.4.4.3.	$\frac{4}{50}$	4.5.5.5.	$\frac{4\frac{3}{4}}{50}$
1st Annectant Conv. „ „	5.5.4.	$\frac{4\frac{3}{8}}{50}$	5.4.5.	$\frac{4\frac{3}{8}}{50}$
2nd „ „ „ „	5.5.5.	$\frac{5}{50}$	5.5.4.	$\frac{4\frac{3}{8}}{50}$
3rd „ „ „ „	5.6.5.	$\frac{5\frac{1}{2}}{50}$	4.4.4.	$\frac{4}{50}$
Superior Occipital „ „	3.4.4.	$\frac{3\frac{3}{8}}{50}$	3.4.4.	$\frac{3\frac{3}{8}}{50}$
Middle „ „ „ „	4.4.4.	$\frac{4}{50}$	3.4.4.	$\frac{3\frac{3}{8}}{50}$
Inferior „ „ „ „	5.4.4.	$\frac{4\frac{1}{2}}{50}$	5.4.3.	$\frac{4}{50}$
Supr. Temp. Sphenoid „ „	5.5.5.	$\frac{5}{50}$	4.5.5.	$\frac{4\frac{1}{2}}{50}$
Middle „ „ „ „	5.5.4.	$\frac{4\frac{3}{8}}{50}$	5.5.5.	$\frac{5}{50}$
Inferior „ „ „ „	5.4.4.	$\frac{4\frac{1}{2}}{50}$	5.3.4.	$\frac{4}{50}$
Orbital Lobe, Marginal Conv. „ „	3.3.3.	$\frac{3}{50}$	3.3.3.	$\frac{3}{50}$
„ „ Internal „ „	4.4.3.	$\frac{3\frac{3}{8}}{50}$	4.4.4.	$\frac{4}{50}$
„ „ External „ „	4.4.4.	$\frac{4}{50}$	4.5.5.	$\frac{4\frac{3}{8}}{50}$
„ „ Posterior „ „	5.5.3.	$\frac{4\frac{1}{2}}{50}$	5.4.4.	$\frac{4\frac{1}{2}}{50}$
Central Lobe, Antr. Conv. „ „	6.6.	$\frac{6}{50}$	6.5.	$\frac{5\frac{1}{2}}{50}$
„ „ Middle „ „	5.5.	$\frac{5}{50}$	5.5.	$\frac{5}{50}$
„ „ Posterior „ „	5.5.	$\frac{5}{50}$	5.5.	$\frac{5}{50}$
Marginal Convolution „ „	5.5.5.	$\frac{5}{50}$	5.4.5.	$\frac{4\frac{3}{8}}{50}$
Gyrus Fornicatus „ „	4.4.4.	$\frac{4}{50}$	4.4.4.	$\frac{4}{50}$
Quadrilateral Lobule „ „	4.4.4.	$\frac{4}{50}$	3.4.4.	$\frac{3\frac{3}{8}}{50}$
Cuneate Lobe „ „	4.4.4.	$\frac{4}{50}$	3.4.4.	$\frac{3\frac{3}{8}}{50}$
Uncinate Gyrus „ „	4.4.3.	$\frac{3\frac{3}{8}}{50}$	4.3.4.	$\frac{3\frac{3}{8}}{50}$
Internal Temporal Convolutions	5.4.4.	$\frac{4\frac{1}{2}}{50}$	4.4.4.	$\frac{4}{50}$

BRAIN OF J. J. (SENILE DEMENTIA), *Continued.*

Relative depth in the various groups of Convolutions.

	Right.	Left.
Frontal Lobe ... ..	$\frac{5\frac{1}{2}}{50}$	$\frac{5\frac{1}{2}}{50}$
Parietal ,, ... ..	$\frac{5}{50}$	$\frac{5}{50}$
Annectant Gyri ... ..	$\frac{4\frac{1}{2}}{50}$	$\frac{4\frac{1}{2}}{50}$
Occipital Lobe ... ..	$\frac{4}{50}$	$\frac{4}{50}$
Temporo-Sphenoidal Lobe ... ..	$\frac{5}{50}$	$\frac{5}{50}$
Orbital Lobe .. ... ..	$\frac{4}{50}$	$\frac{3\frac{1}{2}}{50}$
Central ,, ... ..	$\frac{4}{50}$	$\frac{5}{50}$
Marginal Convolution, Gyrus Fornicatus, } Quadrilateral Lobule ... .. }	$\frac{4\frac{1}{2}}{50}$	$\frac{4\frac{1}{2}}{50}$
Cuneate Lobe, Uncinate Gyrus . ...	$\frac{4}{50}$	$\frac{3}{30}$
Internal Temporals ... ..	$\frac{4}{50}$	$\frac{4\frac{1}{2}}{50}$
The Hemispheres ... ..	$\frac{4\frac{1}{2}}{50}$	$\frac{4\frac{1}{2}}{50}$
Average depth of the whole Cortical Substance = not quite $\frac{1}{10}$ inch.		

BRAIN OF M. B. (CHRONIC MANIA), *Continued.*

Relative depth in the various groups of Convolutions.

	Right.	Left.
Frontal Lobe ... ..	$\frac{5}{50}$	$\frac{5}{50}$
Parietal ,, ... ..	$\frac{5}{50}$	$\frac{5}{50}$
Annectant Gyri ... ..	$\frac{5}{50}$	$\frac{4\frac{1}{2}}{50}$
Occipital Lobe ... ..	$\frac{4}{50}$	$\frac{4}{50}$
Temporo-Sphenoidal ... ..	$\frac{4\frac{2}{3}}{50}$	$\frac{4\frac{2}{3}}{50}$
Orbital Lobe ... ..	$\frac{4\frac{3}{4}}{50}$	$\frac{4}{50}$
Central ,, ... ..	$\frac{5\frac{1}{2}}{50}$	$\frac{5}{50}$
Marginal Convolution, Gyrus Fornicatus, } Quadrilateral Lobule ... .. }	$\frac{4\frac{1}{3}}{50}$	$\frac{4\frac{1}{2}}{50}$
Cuneate Lobe, Uncinate Gyrus ... ..	$\frac{4}{50}$	$\frac{4}{50}$
Internal Temporals ... ..	$\frac{4\frac{1}{2}}{50}$	$\frac{4}{50}$
The Hemispheres ... ..	$\frac{4\frac{1}{2}}{50}$	$\frac{4\frac{1}{2}}{50}$
Average depth of the whole Cortical Substance = not quite $\frac{1}{10}$ inch.		

It remains for me now to adduce, as the last division of my subject, a few conclusions which seem to be indicated by such observations as I have been able to make. These must of necessity be few in number, for such work on this subject as I have accomplished, has been done with the view of demonstrating the efficacy of my method, leaving other questions which naturally arise as matter for future observation. It will be noticed with reference to the brains, the examination of which I have recorded, that they all represent the organ in a morbid condition; and hence for the present, I must entirely exclude all questions of comparison between the latter state as contrasted with that of health. Such investigation however as I have been able to make, has not been without effect in bringing before me certain facts which I may perhaps at present be permitted to notice, as being, so far as they go, very conclusive and not devoid of interest. Nothing has presented itself more forcibly to my mind, as the result of my method of procedure than the fact, that the depth of the grey matter of the Cerebrum varies in different situations; and that this variation is not accidental or irregular, but is in all cases in accordance with a definite plan. It may be stated generally that as regards the upper surface of the hemispheres, the depth of the cortical layer in the frontal and parietal lobes and in the annectant gyri is not subject to much variation, though as a rule, that of the two former is somewhat greater than in the latter situation. But when, passing backwards from the annectant gyri, the occipital lobe is reached, at once a difference is found in the shape of a marked decrease in the depth of this layer. The change is always sudden, and, so far as my experience goes, it is invariable. We next come to the temporo-sphenoidal lobes, and here again, as compared with the last, we find invariably an alteration in thickness; but in this instance it is in the opposite direction; the temporo-sphenoidal convolutions are in this respect always higher than the occipitals. Pursuing the order which I have followed throughout, the orbital lobes and the convolutions they comprise present themselves for examination. Here, as compared with the last, the result will be found to indicate a diminution in the depth of the grey matter. This is in all cases very marked, and more especially with respect to the

marginal convolutions where the grey covering is very thin indeed. The central lobes, or islands of Ryll, come next in order; and here we find a condition which contrasts very forcibly with that which was observed in the orbital lobes. The grey layer is here always deep; in most cases indeed, I think it will be found to be at least as deep as in any other situation of the hemispherical ganglion. There is a point also which I wish to notice in passing, and that is, pallor of the grey substance in this situation, and as a consequence want of that definition in its depth, which is always so well marked in other parts. I have always found this to be the case, but at present must be content with stating the fact for I do not as yet know how it is to be explained. Passing now to the internal aspect of the hemispheres, we find the marginal convolutions, the gyri fornicati and the quadrilateral lobules. I have but little to say with respect to these; in them the layer of grey matter is of medium thickness, and corresponds pretty closely in this respect with the temporo-sphenoidal convolutions. Proceeding backwards from these however, we find, as was the case in the superficial aspect of the hemispheres, so here, that the depth of the cortical layer decreases. The cuneate lobes and uncinate gyri invariably show a falling off, and this is especially noticeable in the last named situation. Lastly, we have to consider the internal temporal convolutions; and here we find a distinct rise in depth of grey matter, as compared with the cuneus and uncinate gyrus; it does not as a rule, however, present much thickness in this situation, the contrast being due to the very shallow layer possessed by the uncinate. The general arrangement as above described will be found borne out by the four brains, the examination of which I have recorded; and I venture to think, that in the majority of cases it will be found correct. In making this statement it may possibly be thought I am forgetful of the fact, that the brains above referred to represent in each case a morbid condition of the organ. But in truth, I cannot think that I am arguing on a false principle or on insufficient data, for it will be observed that in all four cases, the remarks I have made hold good. The brain of J. M. H. S., who died of acute bronchitis, occurring in the course of acute delirious mania, presented no change or abnormality which we were able to detect;

the progress of the case was too short and rapid to admit of perceptible structural change. Very different in all respects, were the brains of J. B. and J. J., who died in a state of senile dementia; and yet in these three cases, as well as in that of M. B., who died during the course of chronic mania, the variations I have above described were found to exist. Such a fact as this furnishes, I think, pretty conclusive evidence of the general correctness of my statement, especially as I may add further, that in a brain which I have in part examined, and which was not morbid in the sense in which I have before used the word, I found distinct indication of a similar condition and arrangement of the cortical layer.

In the second place, I would point to the fact, and this I do at present only as suggestive of further inquiry, that in the patient who died of acute mania, I have found the average depth of the grey matter to be greater than in the other cases, which had pursued a long and chronic course.

In cases of partial wasting it will be important, and as I hope to show later, practicable, to estimate the extent of the degenerative process more surely than can be done by a superficial examination; and on the other hand, to be able to exclude wasting, in some cases in which appearances are doubtful or deceptive.

It were easy to add to these suggestions for further research; but because it is easy, it is therefore unnecessary. My object for the present will have been fully attained, if I have been successful in furnishing an instrument, which may be of assistance however slight to the physiologist and the pathologist, and an aid however humble in the elucidation of those questions to which I have referred.



# THE MENTAL SYMPTOMS OF ORDINARY DISEASE.

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THE meaning of the title of this paper does not, probably, require much explanation, though it may be, logically, indefinite in the mode of its expression. By 'ordinary' disease, is meant here every affection of the human body which does not usually so influence the mind that the subject of it may be declared insane. In short, to many readers, it will be enough to say that 'ordinary' means *bodily*, and that *extraordinary* would correspond to *mental* disease, and the title might, as far as they are concerned, have been framed, 'The mental symptoms of bodily disease.' But modern physiological doctrines compel us to look on all mental activity, whether healthy or morbid, as essentially *bodily* activity and *bodily* disease; therefore, the word 'ordinary' has been chosen, with this short explanation of its exact signification.

It may seem, at first sight, that the mental symptoms of ordinary disease are so seldom of a pronounced character, and that they vary so much in different individuals, as to make it hardly worth while to bestow much attention on them. But there are at least two ends, very practical and important, which are served by study in this direction. In the first place, it is no uncommon mistake of medical men, to miscalculate entirely the gravity of a patient's state, and to be exposed to the severe

criticism of the public in the matter of prognosis, from their not taking into account the mental symptoms, or rather the mental character of certain symptoms presented by a patient. The 'mistakes' even of consultees, as hawked about among the public, I have not infrequently observed to have been due to a want of perception of the extent to which mind was acting on body at the time of the consultation. There is a something about the 'state bordering on insanity,' which the practised eye of an Asylum physician would at once detect as bringing the patient near his province, but which is put down by the ordinary medical man to the severity of the complaint, or accounted for in some other erroneous way.

The following short case may illustrate what is meant :—

A—— B——, a girl about twelve years of age, was brought to the out-patient department of the Bradford Hospital, in May, 1870, with what was called St. Vitus's dance. The complaint consisted in a continual restlessness, and a jerking of the arms, which, however, rather took the direction of purposed (and mischievous) than of aimless movements. The appearances of chorea were so far present, that, after making a short enquiry, and eliciting the fact that these symptoms had lately become aggravated, though the girl had been peculiar for some time, the remedies appropriate to chorea were given.

After a fortnight or three weeks, no improvement having taken place, and the appearances of some mental defect becoming still more marked, closer enquiry elicited the fact, that the patient came, on the mother's side, of a neurotic family, that she had long ago 'got over' her mother, and that her father could deny her nothing, as she was an only child; hence had arisen persistent wilfulness, obstinacy, and passionateness, till the child had arrived at her present state. On this being discovered, the necessity of moral discipline for the child was strongly insisted on. Still no improvement took place, the mother affirming that it was perfectly impossible for her to do any good when the father of the patient was so indulgent. At last the patient was sent to a Convalescent Hospital, at some distance, in the hope that the discipline of a large Institution might benefit her. She has not been heard of since at the Infirmary.

In such a case as this, no medical man, fully understanding the circumstances, would hesitate to recommend moral discipline as extremely important, even for the cure of those very movements which at first might seem to indicate a decided choreic affection; but the risk is that the circumstances may not at first sight be fully mastered, and that no appreciation may be formed of the extent to which mental symptoms can implant themselves upon a small item of bodily disease, such as the chorea was in this case. Nothing, indeed, except the clinical

experience of lunacy, so much required by the profession at large, but especially by physicians, can entirely remove the liability to such errors. But a short consideration of mental phenomena in ordinary disease may at least serve to direct attention to the subject.

The second end is, that Asylum physicians may have, therapeutically, a greater command over their cases. There can be no doubt about the proper treatment to be pursued, when once it is settled that there is present in an insane patient some diseased condition which may be, and probably is, causing, or helping to cause, the mental alienation. Whether this field for treatment is exhausted I very much question. For the simple purpose of calming the ravings of the chronic maniac it will be found that to take one's indications from the skin, the pulse, and the tongue, often leads to very successful treatment. But it is requisite to pass to the subject in hand.

It is almost unnecessary to state that in a short essay so immense a subject cannot be dealt with exhaustively. It is true, indeed, that if one looks to what has been investigated and laid down with certainty in this field, the whole matter might be put in very short compass. But, if it is the fact that no scientific certainty prevails, it is equally true that the number of more or less vague guesses at the truth, more or less imperfect inductions as to individual relations among bodily and mental diseases is very great, that these guesses and inductions have been made over a long period of time, commencing at least a thousand years before the Christian era, and that they are often tolerably consistent with one another. They cannot, therefore, be neglected; and when we add to them the more occult affections of the body which modern researches show us to have also an influence on the mind, and take into account, too, the directions in which future research seems likely to be pursued with profit, we have before us at a modest estimate, something like half of the whole field of medicine. It will be impossible here to overtake, in any way pretending to be detailed, more than the merest fraction of that field. The aim of this short paper is rather to sketch out the matter in a rough way, so that future research may be guided in some hopeful direction; and that suitable lines of work may be indicated which may in time

rescue different parts of the subject from the vagueness which at present may be said to surround the whole.

The diseases termed 'general,' and usually placed first in the list, are here left over to the end, because what may be said about them will be rather of a speculative character, and not reposing on facts such as the Clinical Case books of the West Riding Asylum, with some notes from ordinary practice, enable me to bring forward for some of the special diseases. We proceed accordingly to the influence of disease in the various organs, on the mind.

If all men's minds were exactly equal to one another in every respect, it is evident that the effect of any given bodily disease upon the mind would vary, in the first place, according to the organ affected; in the second place, according to the intensity of the disease in that organ.<sup>1</sup> It will be well to pursue this view of the question a little in detail.

Among the various organs, the brain is the acknowledged instrument of mind, and, in one sense, it is the most powerful of all in producing mental modifications when it is diseased. When the grey layer of the convolutions is affected in the way of pressure, inflammation, or otherwise, the effect on the mind is at once perceptible. On the other hand, when any other part of the brain is alone affected, the mind often remains singularly free from evident disease. The following two abridged cases illustrate this difference:—

CASE 1.—M—H—, a labourer, was admitted into the Bradford Infirmary on May 26th, 1872, in a comatose condition. It was ascertained that he had been a hard drinker, and that this attack had commenced a few days before with severe headache.

He was ordered a turpentine enema, and a blister was applied to the nape of the neck. Diet, milk two pints, beef tea two pints.

27th May: *In the same condition.* Pulse, morning 88, evening 84; temperature, morning 101·1, evening 99·4. The head was shaved and an evaporating lotion applied.

28th May: *Sinking.* Pulse 160, temperature 102·1. Brandy, egg, and milk enemata to be given every two hours, as he vomits everything. He died this evening.

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<sup>1</sup> The subject being pathological, the second proposition may be held to require proof. But no use is made of that statement in this paper. We may think, perhaps, of the hopefulness of chronic phthisis, the depression of hepatic disease, and the *delirium* of acute miliary tuberculosis, and acute atrophy of the liver.

*Post-mortem examination.*—This revealed injection of the membranes of the brain, opacity of the arachnoid, and effusion beneath it. There were also lymph and serum effused into the pericardium, showing that there had been recent pericarditis.

CASE 2.—E—S—, a married woman, ætat. 38, was admitted into the Bradford Infirmary on May 9th. Suffers from intense headache.

*History.*—Two attacks of rheumatic fever some years ago. No syphilis. Since her last confinement, a year ago, has suffered from pain in her head; it came suddenly at first. (Some of her friends said, after her death, that she had had a fit at this time, and lost the use of her right side temporarily.) Became blind in her left eye, but recovered sight again, and again lost it.

*On admission.*—Intense pain in left side of head; tenderness on pressure over the points of exit of the left trigeminus, and of the right supra-orbital nerve. Left eye blind. She fears the light very much. *Occasionally incoherent; memory much impaired.*

These and other symptoms pointed to a limited inflammatory attack within the head; this was subdued in a few days by leeching and purgatives, when the incoherence disappeared.

At the end of May she was able to sit up and to walk about a little. The ophthalmoscope showed a varicose state of the veins of the left retina. Both optic discs were small. The treatment had been Iodide of Potassium throughout. The headache continued, though not so severely. Bromide of Potassium did no good, and Morphia always made her worse. In the middle of June she had another attack, similar to that when she came in. She was again incoherent. This time she lost the sight of the right eye, and recovered it again, partially at least, on the attack subsiding. She was semi-comatose for a day or two in the end of this attack, which eventually yielded to antifebrile treatment.

She was now quite rational again, but had a certain slowness of manner in answering questions.

29th June: Has had several shivering and sighing fits, resembling hysterical paroxysms. Very sleepless. Has had chloral, in gr.xv doses, from the night nurse, several times last night.

Seemed better to-day in the morning. About eight o'clock in the evening she was seen to get out of bed of her own accord. At ten o'clock she was found dead in bed.

*Post-mortem examination.*—This revealed the existence of a tumour in the brain, with softened and semi-purulent contents, situated beneath the left fissure of Sylvius, and pushing the left optic tract and nerve, as well as the left carotid artery, to the right side. Around the tumour there was much œdema; the left optic tract and nerve were much wasted, as were those on the right side to some extent. The softened interior of the tumour was found to have a communication with the left lateral cornu, and in all the ventricles of the brain, save the fifth, were found to contain more or less glairy matter and pus, the latter predominating. There was much injection of the meninges, and the arachnoid was rather opaque on the right side; the lining membrane of the ventricles was not injected. The left optic thalamus was smaller, softer, and lighter in colour than the right; the left corpus striatum was, perhaps, rather smaller than the



right, and seemed softened. Choroid plexus natural, as also the pons and medulla. The cerebrum weighed  $39\frac{1}{2}$  oz., the cerebellum, 6 oz.<sup>1</sup>

The first of these cases shows how decided is the effect, on the mental life, of an inflammation affecting the superficial grey layers; pressure upon these layers, from inflammatory congestion and effusion, suspended entirely, in that case, the mental processes. Not so in the second case, where the slow growth of the tumour had given time for the brain to accommodate itself to the altered conditions. In this case incoherence did indeed occur; but only when the increased pain and tenderness, and the heightened temperature showed that there was some inflammatory congestion in or near the abnormal growth. For the most of the time during which she was in the hospital, this patient was to all appearance rational; the loss of memory, with which she was affected, could only be discovered on questioning her at some length; she recognised this loss herself very distinctly.

Inasmuch, therefore, as the grey matter of the convolutions is itself the material representative of mind, any agent affecting it, and disease among other agents, will have the effect of interfering with mental phenomena. But, taking the brain apart from the convolutional layer, it is questionable whether it can be said to rank high among the organs whose ailments have an effect on the disposition. I use the word 'disposition' because it is on this side of the mind, on the moral side, that which determines our emotional attitude to external objects, that the real mental working of a bodily disease begins. True, a man who becomes diplopic may declare that there are two moons, and appeal to his eyesight to bear him out, and this is an instance of a bodily disease acting directly on the judgment, but it will at once be recognized that such a case does not come within the intended scope of this paper. If the same man were to refuse, after a few days or weeks, to believe that the double appearance was the result of a disease in his own eye, then there would be a moral or intellectual fault, and his case would be suitable for the present purpose; but it would not fall within this part of the paper where we are supposing all men's minds to be equal to one another.

<sup>1</sup> Death was considered to be due to the irruption of pus, &c., in the ventricles.

It is clear that two cases do not form sufficient evidence, on which to found the conclusions already hinted at regarding the twofold relation of ordinary cerebral disease to the mind. Indeed, there is a widely distributed class of cases, of frequent occurrence in practice, which seem at first to lead to a conclusion opposed to the statement which has just been put forward, viz., that the brain affects the mind chiefly *directly* through the grey layers, and not much otherwise. A typical example of such cases might be somewhat as follows:—A workman while engaged at his occupation, suddenly falls down, unconscious, or perhaps appearing to be conscious but unable to articulate any intelligible words. He is carried home, and the unconsciousness in time goes off, or the patient becomes able to make himself understood, or the power of speech comes back, but there is evidently remaining a loss of power on one side of the body. To use a common expression, the man has had a stroke; he recovers slowly, becomes able to leave his bed, attends, perhaps, as an out-patient at a hospital. But at this point his friends and even his medical man observe an altered state of his disposition. He is irritable and low spirited about himself; or he is often to be seen smiling, and is easily moved to laughter, while at other times he is as easily moved to tears.—Cases of this sort will be quoted in the context. They present this difficulty, when compared with the proposition put forward above, that, the lesions producing the paralysis may not at all, so far as can be seen, affect the convolutional grey matter. The possible explanation of them may be considered here. It is, unfortunately, not of a complete nature. The main fact to be borne in mind is the very great tendency of the pathological changes which cause the phenomenon of ‘stroke,’ to involve the convolutional grey matter more or less. These changes may be of the nature of anæmia, œdema, hyperæmia, stasis, &c., in a part of the brain, or of extravasation of blood or of embolism (which are accompanied by some of the former set), or of any other change calculated to produce local irritation, such as the bursting of an abscess, the formation of an aneurism, &c. But of whatever nature they are, if they produce any change in the volume-relations of the encephalon, they can hardly fail to affect a certain portion of the grey matter, and, in case of prolonged

irritation, to affect it frequently and in varying ways. We do not know, however, that a disturbance of the functions of a certain small or at least limited portion of the convolitional grey matter, must of necessity create a change in the disposition of the sufferer. There is only the barest presumption, if that, in favour of such a view to be got from the cases that follow ; but unless that explanation holds good, it is difficult to see what other is to be found, when the facts brought forward in the next paragraph are considered.

In favour of the view that lesions of the central parts of the brain, are not of themselves apt to affect the mental stability, there are several classes of facts. Every one has read one or more of those curious surgical cases, in which foreign bodies have lodged in the brain, without causing any serious mental or bodily disturbance.<sup>1</sup> No doubt in these cases the grey matter must have been cut away more or less, but the great amount of pressure must have been exercised on white, or at least medullary brain tissue, and yet we are not told of the disposition changing in such cases ; they are rather narrated on account of the fact that no particular change occurred. Next we have the evidence of latent tumours of the brain, which are thus spoken of by Niemeyer<sup>2</sup> :—"These latent tumours of the brain can be situated only in such parts of the cerebrum, as furnish no opportunity for destroying either the intercerebral centres of the cranial nerves, or the conduction of impressions (and volitions) in the centripetal and centrifugal nervous fibres,—therefore, principally, in the outspread medullary (white) substance of the cerebral hemispheres. In this part, tumours sometimes arrive at considerable

<sup>1</sup> Several such cases are given in a work on 'Diseases of the Eye,' by the late Dr. Mackenzie, of Glasgow. The French Surgeon, Larrey, published, I believe, numerous cases of the sort. A patient used to be shown at the surgical clinic, at Aberdeen, from whom Dr. Keith had removed part of the lock of a gun, through an opening in his forehead ; the lock belonged to a gun that had burst close to this man, some years before ; when he was stunned and wounded in the forehead ; at the time of the accident every part of the gun was found, it was said, save the lock, which was never accounted for, till Dr. Keith drew it from the man's head, where it had lain apparently imbedded in the frontal lobes. The only visible signs of any deep mischief, during the years that had elapsed before the operation, were a sinus and perforation of the bone, which refused to heal, and some discharge.

<sup>2</sup> 'Lehrbuch der Speciellen, Pathologie und Therapie,' p. 258.

dimensions, without producing symptoms of localised mischief in the brain, whereas at most parts of the base, and, in the region of the large ganglia, even the smallest tumours are accompanied by symptoms of this sort." The white matter of the brain may, therefore, be modified to such an extent as to contain a tumour of considerable size in its substance, and still the diseased process may run its course, as the author says, a little further on, "völlig latent," i.e., in a perfectly latent manner, with no symptoms, either mental or bodily. When a tumour occupies some part at the base of the brain, Niemeyer states that symptoms are produced. But still these are not often mental symptoms, as will be seen from the following quotation :—

"Affections of the mind (psychische Störungen) are not present in many cases of cerebral tumour at any period in the history of the disease. In fact, it would appear as if the psychical functions are only impaired, when either the superficial grey matter of both hemispheres is altered in its texture, or when the circulation through it is seriously obstructed."

To pass to a more general aspect of the question, than that which has regard to tumours alone, we may ask, whether it is common, in examining *post-mortem* the bodies of insane patients, to find signs of localized lesion in the brain. Were it so, we should be obliged to attribute a considerable influence over the mental centres to their neighbouring and related parts. But the fact is otherwise. The following statement, for instance, is made by Griesinger<sup>1</sup>:—"It is, as a universal rule (durchaus), the diffused and more general affections, in which either a very large portion of the brain, or else a great extent of its internal (ventricular) or external surface is involved, that are found in the insane much rather than the circumscribed, localized affections; and, more particularly, a comparison of the facts about to be brought forward, seems to point decidedly to this conclusion, *that the most important and most constant lesions in insane persons, are those that consist of diffused morbid processes in the outer layers of the cortical substance, that is, in the superficies of the brain, and in the inner membranes that envelope the same.*"

From several points of view, therefore, we may see our way

<sup>1</sup> 'Die Pathologie und Therapie der psychischen Krankheiten,' p. 422.



to the conclusion, that the disposition is not altered, nor insanity produced as a consequence of a lesion in the brain not affecting the superficial grey matter. It must be remembered that we are at present supposing all human mental organizations as equal to one another, and, therefore, that the case where there is a predisposition to mental disease, where the brain already bears the stamp of the insane diathesis, transmitted to it from ancestral organs, is not now under consideration. We need not be surprised to find that a thoroughly healthy convolitional mass remains true to its functions, even when the organs which are most nearly related to it, functionally, the subsidiary ganglia and nerves, are partly disabled; nay, that organs far more distant, and related to it more from a nutritive than from a functional stand point, have positively more influence when themselves disturbed, in disturbing in turn the highest cerebral functions, than these nervous masses have; while, on the other hand, when the mental centres themselves are weak, the very parts which formerly were the most innocuous, even when diseased or otherwise disordered, have the power, by virtue of their close functional relation, to keep up constant irritation in the weakened brain, and in the end to produce insanity.

The following are cases of disease of the brain, with notes upon the mental effects, intended to illustrate, as far as possible, what has been said:—

CASE 3.—W——— M———, ætat. 46, Married.—Admitted to the Bradford Infirmary on 6th June, 1871, with partial paraplegia. He could walk, but only with assistance on either side.

*State on admission.*—He is a man of middle height, square built, stout, dark haired, with a rather vacant and smiling expression of face. His mind appears to be totally wanting in vigour, at present, but, from enquiries made, he seems never to have been up to the average in this respect. He can retain his urine for the most part. Paraplegia has been gradually coming on for three years.

*History.*—He was treated by Faradization to the thighs and glutei, and strychnia. Some improvement was becoming manifest, when, on June 23rd, he had a 'stroke,' resulting in partial left hemiplegia, most marked in the arm and leg, and interfering with articulation to some extent. In the morning he had been subjected to rather a severe current of the Stöhrer's battery, under which he strained severely, raising himself almost on his shoulders and heels as he lay in the bed. He did not, however, complain of pain. It was a question whether the straining had not overdone the sensorio-motor nervous centres, and so first produced the hemiplegia. He was conscious throughout.

The symptoms of hemiplegia and paraplegia both improved subsequently so



far that he could walk a little without assistance, and he went out 'improved' on September 4th. During the whole course of treatment he remained in the same tranquil, pleased frame of mind, and, on the whole, seemed in better spirits than the circumstances warranted, but these peculiarities were not more marked after the hemiplegic attack than before.

In this case we see an affection of some of the basal ganglia of the brain, passing over without any mental disturbance. The only sign of such is thus remarked in the full notes of the case. On the day after the seizure, "the patient laughs very much when attempts are made to shift his position." It must be remembered that the circumstances were eminently favourable to a tranquil state of the circulation in the brain, as he was kept in bed after the attack, the diet made to consist of liquids, given in moderate quantities, and as purgatives were administered with good result immediately on the accident occurring. This, therefore, would seem the simplest course of limited mischief in the non-convolutional grey matter. Another case which supports the same conclusion, occurred in the Bradford Infirmary about the same time, and is published in the *Lancet* of September 16th, 1871, under the title of 'Shifting and recurring partial hemiplegia, in a patient suffering from Bright's disease.' In this instance, also, the mental powers remained unimpaired, and the patient was quite up to the average of Hospital patients in intelligence.

The next case illustrates, however, a further stage in the mental invasion of the cerebral lesions now under consideration :—

R— G—, ætat. 21, single, was admitted into the West Riding Asylum on July 1st, 1871.

The facts observed by the certifying medical man and others, were "imbecility to understand or answer to simple questions, endeavours to break causelessly and purposelessly," &c.

Nothing is known about his antecedents. He says he had a stroke about Christmas last, and has ever since had some difficulty in articulating plainly, not being able to recollect anything for three weeks afterwards. He has had strokes before, always affecting the left side.

*Present Mental Condition.*—He is very childish in manner, and simple-minded. He comprehends his position, answers questions intelligently, and is capable of giving an account of his past history. Combines simple-mindedness with cunning. Is perfectly pleased, and happy and contented.

*Physical Condition.*—Very stout, complexion florid, grey eyes, has a silly pleased expression, the mouth is decidedly drawn to the left side. The pupils are equal and active. Tongue points a little to the right side. Deficiency of muscular power of left side. Along the median line of the head, and transversely about half way back, there is a space, forming a cross, on which the hair does not appear to grow. Whole skin covered with minute white spots.

21st July : No change mentally ; bodily health good.

22nd July : Tried to escape. Excitement ensued on his being prevented.

September 13th : Excitement gone ; mind unchanged.

October 16th : Frequently excited ; in good bodily health.

March 20th, 1872 : Has rapidly improved since last report, and got quite fat. Discharged on this day, recovered.

Such a case as this, where matters did not come to a necropsy, can only be dealt with, and reasoned about, in rather a vague manner. Still it illustrates, as forcibly as can be expected from the materials, a close connection between a diseased process in the brain, of a localized nature, and decided emotional disturbance. We have no record whether the partial paralysis disappeared before the patient's dismissal, but the history of the case shows that the central lesion was already being repaired some months before his admission, and perhaps even before mental symptoms came on. We can easily see that the repair of an injury to the brain may be fertile in producing disturbance of the grey superficial layers, especially when, as is often the case, contraction is one of the events that takes place. This case, therefore, though one of those opposed to the general maxim previously stated, that lesions in motor (&c.) brain centres have not, as a rule, any mental effect, is also one admitting of the explanation just offered for such exceptions.

W— J—, hammerman, ætat. 34. Married.—Admitted to the West Riding Asylum, 12th of May, 1871.

Facts observed :—"That he remains in bed, or in one corner of the room, muttering and talking to himself," &c., &c.

Communicated by his wife :—"That about eighteen months ago he had a stroke, since which time his memory has been gradually failing, and that at times he is so violent that it is dangerous to be near him," &c.

First attack ; has been insane three weeks ; supposed cause, a paralytic stroke a month ago ; is not epileptic, nor suicidal, nor dangerous ; has two children ; can read and write.

No family history of insanity, epilepsy, or phthisis. He has lived freely, and had drinking bouts occasionally. No alteration in his character has been observed. Three weeks ago he had a 'stroke of paralysis,' after which he lost the power of articulation, but retained the use of his limbs. Since then he has become demented and unable to give any account of himself. A week ago he became excited and violent, and had to be removed to the workhouse. He had been drinking before the stroke of paralysis.

He has not given vent to any delusions. When spoken to he does not reply at once, and appears much confused, and when he does reply it appears to be a great mental effort, and he appears restless and rolls about. Pre-occupation of the mind seems to be the cause of his not replying. Is able to tell us that he was in the workhouse three or four days before coming here.

Is above the middle height, light brown air, brown eyes, pupils equal and sluggish, pulse 80 compressible, heart sounds feeble and distinct, but otherwise normal. Slight dullness on percussion over left chest ; breathing purrile ; right chest normal ; face flushed. Wherever circulation in skin seems feeble, com-

pression produces a red mark, which remains some time after pressure is removed. Movements rather slow ; skin greasy ; patient fat.

July 26th, 1871 : Patient was to-day discharged, recovered.

This is again one of those exceptional cases where a cerebral lesion is accompanied by mental affection, amounting to insanity. The disposition towards easy disturbance of the superficial grey centres is necessarily much enhanced when the patient is, as this man was, addicted to drinking.

We have not considered how far, in these two cases, a predisposition to insanity existed. Probably enough it did so in both of them, for the statement to the contrary, in the latter instance is not much to be relied on at any time ; and, in the former, there appeared to be a certain amount of natural silliness. There does not seem, however, to be sufficient ground for attributing the mental phenomena wholly to such an origin.

The next case has a similar bearing :—

J—A—, engine tender, ætat. 47. Married. Admitted to the West Riding Asylum, 20th September, 1871.

Facts observed :—Considerable hysteria, depression of spirits, immoderate laughter, and great alteration of general character ; also manifestations of great violence, throwing knives and forks at his wife and children, beating them with great violence, threatening to commit suicide, and to murder them all.

Is a Dissenter ; has been in no Asylum before ; duration of this attack, three years ; cause unknown ; not epileptic ; is suicidal and dangerous to others ; has five children ; can read and write ; has no relatives similarly affected ; not attentive to the calls of nature ; head not injured.

*History.*—About three year's ago, patient had 'a stroke,' with hemiplegia of the left side, which confined him to bed for about one month. His mind has been unsound since this attack. He has, however, done a little work as occasion offered. He has never recovered the entire use of his left side, which is still weak. He has not been a confirmed drunkard, but has been in the habit of indulging occasionally. During the last six months he has been low-spirited, and of little or no use at his ordinary occupation. Nothing is known which could account for his present condition, except the apoplectic attack before mentioned. There is no family history of insanity, paralysis, or fits. Of late he has become dangerous, and would throw knives or anything he could get hold of at his relatives, his attacks being chiefly directed against his children. He has often talked of running into the water, but has never actually attempted suicide.

*Mental Condition.*—Patient seems somewhat depressed. He answers ordinary questions rationally. He admits having thrown knives at his children, but says he knows it to be wrong, and would not do it again. He sleeps well, does not dream much, and has, so far as can be ascertained, no delusions nor

hallucination. His memory seems a little uncertain, but, on the whole, pretty accurate.

*Physical Condition.*—Patient is of good average height, of dark complexion. Eyes bluish grey. Pupils are equal, of normal size, and active. Patient is fairly nourished. There is a slight impairment of power on the left side. His walk presents nothing peculiar. Respiratory system normal. There is a slight roughness of the second cardiac sound. Tongue clean, and steady. Bowels regular. Appetite good.

October 14th : Patient much improved, removed to ward 20.

November 7th : Convalescent for some time.

November 23rd : The patient was to-day discharged, recovered.

Somewhat related to these is the following :—

J— W—, a sexton, ætat 60, admitted June, 1871. Had had tremors confined to the right side of the body for fifteen months, when an attack of depression of spirits came on. The tremors began with numbness in the right foot.

On September 18th, inequality of the pupils was noticed, the left being the larger. The patient had a habit, about this time, of throwing off the bed-clothes.

On November 24th, he was discharged, recovered.

The following case, which probably represents lesions both of the basal motor ganglia and of the superficial grey matter (such as by embolism, clot, or aneurism in connection with one of the larger cerebral arteries), is of considerable interest. It should be observed that the predisposition to insanity was present, and the child-bearing period added another very dangerous factor to the antecedents of the case.

S— A— H—, admitted to the West Riding Asylum 18th June, 1872. Surgeon observed wild expression of countenance, easily excited without any cause, rambling on various subjects, loss of sleep, loss of memory, destroying her clothes by cutting them up. Ætat 41, married, Church of England, first attack ; has not been in any Asylum ; duration of attack about 1½ years. Cause unknown, not epileptic, nor suicidal, nor dangerous. No further information was given.

*History.*—No very clear account could be got of the antecedents of the patient, as the husband did not appear. She has had sixteen children, of whom the youngest is fifteen months old. She has been in her present condition for the last year and a half. The first appearance of her malady was her being attacked with a fit, in which her face was drawn to one side. Since then she has been quite demented, destroying bed linen, and anything else she can get, but is said not to be dangerous to others. None of her own relatives suffered from insanity. Her husband is said to be a quiet and decent man. Her own account is, that her husband receives good wages and lives in a comfortable way. Of her sixteen children, two only are alive, thirteen died early of Phthisis, one of water on the brain, with Phthisis ; her mother also died of Phthisis. Her paternal grandfather was out of his mind before death. The loss of power in her face took place while she was pregnant.



*Mental condition.*—She talks continually, wandering from one thing to another, and takes a happy view of everything, but says she can't sleep, and has had hallucinations of vision, in which she saw her husband's father in flames, and our Lord, who spoke to her. But she has perfect self-possession, knows where she is, what has happened, and the day of the week.

*Physical condition.*—The patient is under average height, fairly nourished, black hair turning grey, grey eyes, with equal pupils, contracting well under light. Her face has a startled expression, and is not symmetrical on both sides. Occasional lisp and sighing of voice. Decidedly more power of left than right side, but muscles of right side are well nourished. Lungs perfectly resonant. Heart sounds normal. Tendency to flushing of the face. Fulness of thyroid.

January 19th : Ordered Conium in  $\frac{3}{4}$ ss doses.

January 20th : Patient noisy and excited. Talks incessantly and unconsciously, &c.

\* \* \* \* \*

January 30th : Has continued excited. Ordered half-grain doses of Phytostigma.

February 2nd : Decidedly quieter both during night and day. Takes her food well.

March 11th : Has continued quieter, but 'evidently labouring under organic disease of the brain.'

April 13th : Has improved remarkably in bodily and mental condition. Is occasionally mischievous, but, as a rule, quiet and rational.

It must not be forgotten, however, that while special cases of mental affection with local cerebral disease, such as those above given, are of not infrequent occurrence, the general rule is as stated before, viz., that this kind of disease has not, in itself, much power, if any, to modify or overturn the faculties of the mind. Indeed, in that very class to which the typical example just referred to belongs, viz., local softening, many examples might be brought forward, in which the patient remained to all intents sane and well, though a careful observer might light upon a slight and transient mental weakness. Such, for instance, are the two following cases, which require only to be briefly mentioned :—

E— M—, ætat. 32, a labourer, applied as an out-patient at the Bradford Infirmary, on June 5th, 1871.

Six weeks before he had had 'a fit,' in which, however, he was not unconscious, but only fell down. On endeavouring to recover himself, he found he had lost the use of his right arm and leg, and also, in part, the power of articulation. He had regained the use of these parts, to a certain extent, at the time of application, and complained principally of weakness in the loins. He was treated for long with quinine, strychnia, and other tonics, still remaining, however, very weak. Eventually he was benefited very much by a course of Iodide of Potassium with Iodide of Iron, and, after being under treatment for a year,



he was discharged, cured, on July 1st, 1872, able to resume work. Throughout his attendance, he always spoke and acted like a very sensible man, and, if any mental defect at all could be observed, it was rather an undue despondency about the time when he first came under notice, and a slight tendency to give way to emotion.

M—— D——, ætat. 32. a married woman, applied as an out-patient, on April 18th, 1872.

She had partially lost the power of her right side 'in a fit' some weeks before and had not regained it. She was not unconscious at the time of the fit.

She was treated with Iodide of Potassium and Iodide of Iron combined, and was going on favourably when last seen (May 15th).

The modification of the mental powers noticeable on the three occasions when she was seen was very slight, if it existed at all.

Other similar instances could be quoted. They tend to show that even in cases presenting the same typical symptoms, brought forward above, the mental powers may remain almost undisturbed. Loss of memory, for certain events, is a not unfrequent occurrence in these cases, and is to be reckoned, strictly speaking, as a mental symptom. But the emotional symptoms seem to me to bear no exact relation to that loss, and it cannot, therefore, be reckoned as a real advance towards modification of the whole mind: while, on the other hand, it may admit of a purely mechanical explanation, the white matter of the brain, which serves for conduction (a process, one may legitimately guess, necessary to the action of memory), being broken down or pressed upon in the course of the physical lesion.

In attempting to systematize our subject in regard to ordinary diseases of the brain, it may be said that such affections as softening, abscess, and tumour of the brain have, probably, no influence on the mind, except in so far as they involve the superficial grey layers; that meningitis, acute and tubercular, cerebro-spinal fever, sunstroke, chronic hydrocephalus, hypertrophy of the brain, and some cases of atheroma of the cerebral arteries, have a direct influence, owing to their involving these layers; and that no affections of the average healthy brain appear to have that indirect working on the mind, either in the direction of emotional depression or exaltation, which certain thoracic and abdominal organs appear to possess in a considerable degree.

When we descend to portions of the cerebro-spinal system lower than the cerebrum itself, there seems, so far as can be

guessed from very limited experience and study, to be some reason to suspect an influence of an appreciable, if not of a powerful and distinct sort on the psychical life. In bringing forward some considerations which bear on this head, a remarkable case, which occurred in the West Riding Asylum, may first be quoted :—

E— K—, ætat. 61, Calvinist, was admitted to the West Riding Asylum on 19th February, 1870.

*Facts indicating insanity.*—Starts from her seat in an excited manner, as if for the purpose of attacking some one about her, and then begs pardon, stating she cannot help it. Frequently asks the question, “What shall she do?” States that she is afraid of injuring herself and those about her. Desired that a carving knife might be removed, that she might not injure any one. States that she is in hell half her time, and acts as if she was suffering tortures.

*History.*—Four months ago she became depressed. Since then she has frequently been excited and violent. Attacks of this kind alternate with periods of depression. She has not slept well. No cause can be suggested.

February 21st : She is a tall stoutly-built woman, with iron grey hair ; pupils are of normal size, and sensitive to light. She is very impulsive, jumping up suddenly and smashing windows, saying afterwards that she felt so outrageous that she couldn't help doing it. She is now in a state of great agitation, saying that the devil has come to take her away. Asseverates that this is ‘no delusion but a real fact,’ and that he is now concealed in the room, only waiting an opportunity to seize upon her. She is moaning and talking constantly, so that a physical examination cannot be readily made. As far as can be ascertained, however, the heart and lungs are normal. Ordered Potass. Brom. 3ss *ter die*.

March 21st : Is now suffering from swelling of the legs. There is no albumen in the urine. There are a number of reddish purple spots and vibices upon the legs.

March 25th : There is a distinct bruit after the first sound at the base of the heart.

September 27th : For a fortnight past has been purged several times a day. The stools are of a dark colour and free from blood. She remains in bed and is constantly moaning as if in mental pain. Is becoming emaciated. Pulse 120. No appetite. Taking Pil. Cupri. Sulph.

September 30th : Died this day.

*Post-mortem examination.*—Head : Skull cap very unsymmetrical, bulging sharply at the middle of the left parietal bone. Bones thin and eroded for the vessels ; dura-mater free. Brain weighs 48½ oz. Very little thickening of the arachnoid, and the convolutions are fairly plump, but there is some wasting of the parietal lobe. On removing the brain, an encysted tumour is found lying across the antero-inferior aspect of the pons varolii, which is flattened. The tumour, about the size of a walnut, has a thick fibrous coat of a creamy white aspect, and great tenacity, and free pulpy contents of a coarsely granular consistence, and of a yellowish colour, like ground rice pudding. The tumour is external

the pia-mater, to which, however, it is attached by loose fibrous bands, which also unite it to the cerebellum on both sides. It has compressed the basilar artery, which is compressed where it has passed under the tumour. The flattening of the pons is most marked on the right side. The fifth nerve on both sides is soft and pulpy. The substance of the brain is firm, and of a pale colour throughout. Ventricles slightly dilated, and full of fluid. No clots nor atheroma. The pons, medulla, and cerebellum weigh 6 oz. The whole small intestine and cæcum are ulcerated in points.

The fact of no family history of insanity being present in this case, along with the consideration that the pons varolii and neighbouring parts must have been considerably damaged by the growth of the tumour, speaks in favour of the inference that the local disease was connected with the mental affliction. But such an inference is, from a logical point of view, of the loosest description. Further evidence is required, and may be given to a certain extent.

It is probably just to regard hydrophobia as an affection of the medulla oblongata and pons varolii in the first instance, or, perhaps, it would be more correct to say that in these regions the local manifestation of the presence of the poison in the system takes place. We cannot, therefore, recognise, as present in the brain, any such strong attraction for this poison as exists in those inferior centres. Nevertheless, in almost every case of this disease, the brain and mental faculties become affected sooner or later, and maniacal paroxysms come on. These may be explained in three ways; either the poison in the end affects the brain, which is not probable, since there can be increase in the amount of the virus as the disease goes on; or the excessive fear of the characteristic spasms coming on, acts as a cause of genuine madness; or, lastly, an affection of the centres now being treated of, has, in its own nature, and by means we cannot yet explain, an influence over the psychological life. The last explanation is that bearing on our present theme.

On the other hand, we find in the allied disease, tetanus, an undoubted affection of the spinal and some of the higher centres, throughout the course of which the mind remains apparently clear. Two other affections of the spine, viz., the wasting of locomotor ataxy, and that of progressive muscular atrophy, are less certainly unaccompanied by a change in the psychological

manifestations. In a paper published in the 'West Riding Asylum Reports' for 1871, several cases of locomotor ataxy, accompanied with mental alienation, were quoted or referred to, and it may be that, in cases which do not go to this extent, close and continued observation would show slight aberrations from the normal state. At the same time, I have seen at least one case where the patient, who had been ill some years, retained, to all appearance thoroughly, his mental powers and natural kindness of disposition, and I have heard of other similar instances. Progressive muscular atrophy has appeared in two cases which have been under close observation to be accompanied by a considerable buoyancy of the disposition, and a hopefulness out of proportion to the patients' very much enfeebled state. Again, according to the researches of Simon of Hamburg, not only is paralytic dementia, or, as we call it, the general paralysis of the insane, accompanied by the advance of disease in the spinal cord, but, in some instances, the first steps in the direction of this paralysis seem to be made in the spinal cord itself.

The following interesting case seems to afford an example of this :—

H—— S——, grocer, admitted 20th March, 1871, into the West Riding Asylum.

Facts observed :—"That he is constantly rambling, and talking in a loose and violent way, and that he is with difficulty roused to answer a question, and that only the most simple one." Also, "That he will walk in a manner showing that he has no idea where he is going, that he has no idea when meal times come, and that he feeds in a voracious manner. He has twice taken up the poker, and would have struck had not the person moved away."

Ætat. 39 years, single. First attack. Duration nine months. Cause unknown. Not epileptic nor suicidal. Is dangerous. Has no children. Can read and write. No relatives similarly affected. Not attentive to the calls of nature. Head not injured.

He was a fairly healthy man up to a year ago, when he became peculiar in his conduct. Before this, however, he had experienced some loss of power in his lower limbs. For this he was treated in the Hydropathic Establishment at Matlock. He regained power in the lower limbs, but became demented, and wandered about the house from room to room in a very cloudy condition. His speech became impeded and the paralysis returned, but seemed at some times better than at others. He has been incapable of returning to his business since the attack. He sometimes thinks that his bed is a cart. At times he says that his legs are not his own, and beats them. He has, moreover, exalted ideas, for he will order fifty boxes of coals to be put on the fire, and order a hundred rounds of boiled beef. He is said to be a masturbator, and this is the supposed cause of his insanity.



*State on admission.*—He is much demented, and still has the exalted ideas before mentioned. He speaks slowly, indistinctly, and with a great deal of hesitation. Pupils are equal; he seems intolerant of light, and has slight ptosis of the left eyelid. His gait is very unsteady, and there is great muscular tremor of the limbs. He is dirty in his habits. The action of the heart is slow. The first sound of the heart is slightly prolonged, and both sounds are distant and feeble. Lungs healthy. He is about 5 feet 9 inches in height, with a florid complexion, brown hair and eyes, is well nourished, and free from marks of bruising, &c.

March 23rd: Though still somewhat noisy, is quieter than when admitted. Has been taking Potass. Bromid. 3 ss and Tinct. Hyoscyami 3 ss, &c.

April 29th: He has been purged at intervals for a fortnight past; for this he has taken a chalk mixture. Yesterday he was ordered a mixture of dilute sulphuric acid and opium. Last night purged four times.

May 2nd: Still purged.

May 25th: Purging has ceased.

November 2nd, 1871: Patient gets more demented, is wet and dirty in his habits, and very shaky on his legs. Yesterday patient's brother stated that he thought the disease was brought on by masturbation.

May 9th, 1872: Gets steadily worse. Is up and about daily, however.

In another very interesting affection, viz., labio-glossolaryngeal paralysis, I have had no experience, but in a case of Dr. Clifford Allbutt's which I, among others, saw, the mental powers seemed to be entire, and, if I mistake not, were stated by Dr. Allbutt to be so. Close observation may, however, in the future, reveal something further on this point. Chorea is another disease which must be mentioned here. Though the lesion in that affection is not yet known, and it still remains a 'functional' disorder, we cannot doubt that some morbid action in the spinal and sensori-motor centres is present. Now, in this disease, the mental dullness appears to me to be of a very marked sort in many cases. There is often, also, a certain wilfulness, and altogether a change in the ordinary disposition of the patient. To the motor nervous centres must also be referred another affection, viz., paralysis agitans, which generally comes on in persons whose mind as well as body is decaying from advanced age. Younger persons may, however, fall victims to one form of it, and two such cases have come under my notice. One of these was a young married woman, about twenty-six years of age, who was under the care of Professor Harvey, in the Aberdeen Infirmary. The tremulous movements took place altogether, or almost altogether, when she exercised her will. She appeared the most unlikely person



to be hysterical, being an exceedingly sensible and good-hearted girl, but there was an undoubted tendency towards undue emotion in the directions both of exaltation and depression, when she was spoken to on the subject of her illness. The very painful nature of her case, she being quite unfitted for any—even domestic—work, may, of course, have produced this psychical result. I had, at any rate, abundant opportunities, in the course of electrical and other treatment, of observing this point in her disposition, and of ascertaining that it was a new feature in her character.

The other case is as follows :—

R—L—, an Italian, ætat. 34, model maker, was admitted into the Bradford Infirmary on July 11th, 1871, suffering from paralysis agitans. The affection was evident, both in his arms and in his legs when he tried to stand ; it had come on gradually during the last eight months, and betrayed itself first in the imperfections of the models which he produced. He spoke hesitatingly, but could articulate tolerably. When he was set on his feet his legs shook so violently that he could not speak with any steadiness.

He was treated at first with Dilute Phosphoric Acid, that was changed to Nitrate of Silver on July 21st, and he was improving when, on July 27th, after having a severe headache, while walking in the ward, he was observed to stagger, and, on being got to bed, it was found that he had partially lost the power of speech, the power of the right forearm, and probably also that of the right leg. These faculties he gradually recovered, under the renewed use of the Nitrate of Silver (suspended for a day or two at the time of the 'stroke') ; the agitation likewise disappeared, but a certain degree of blindness seemed to indicate the presence of some disease within the brain. He was discharged, 'improved,' on August 24th.

Throughout the course of his case, there was a marked tendency towards emotional manifestation, showing itself generally in the shape of immoderate laughter and great cheerfulness when he was addressed. At the same time his answers were sensible enough. Sometimes weeping took the place of laughter.

These two cases of paralysis agitans, therefore, tend to confirm the idea that lesions of some centres, at least, below the cerebro-mental, are the causes of psychical anomalies. Taking them along with what has been said in the paragraphs preceding them, we may claim, probably, with some show of truth, a certain mental effect as a probable accompaniment of many diseases of the centres below the highest.

Were the pathology of epilepsy in any way settled, we might know one organ at least, or set of organs, disease in which is

decidedly hurtful to the mind. But in the absence of a certain pathology, the subject need not be entered on here. It is, of course, possible that a direct effect, produced during the fits upon the convolutional grey matter, is the origin of the mental ailment, in which case the disease is not of so much interest from our present point of view.

In ordinary neuralgia, and even in hemicrania, there is no evidence, so far as I know, of any special accompanying mental effect, beyond the depression and anxiety produced by the severe pain.

It would be of little use to go over, in detail, the diseases of all the bodily organs, since, as regards many of them, there is really no good evidence to be brought forward. Some of those which seem to have any psychical connection may be mentioned here, and the only general statement that can be affirmed is that very influential over the *psyche* are those organs that contribute to the purely nutritive life of the body, those, in other words, which are plentifully supplied from the great sympathetic system of nerves, and which might seem farthest removed by nature from disturbing the proper performance of the highest cerebral functions.

Among diseases of the eye, exophthalmic bronchocele is the only one that seems to me to call for any remark, and its place is not properly here, but rather, perhaps, among general diseases. It is accompanied, according to my observations, which have, however, been limited to one case, complicated with uterine disease, by an anxiety and restlessness like those that may be observed also in Addison's disease. Among nasal affections, the stupidity which often accompanies ozæna, and especially when the frontal sinuses are affected, has alone struck me. The contrast, again, between the irritability often produced by deafness, and the general softening of the disposition usually produced by blindness, is one sometimes remarked on in common life. Othhæmatoma is rather an instance of a bodily symptom of mental disease than the reverse, and an endeavour has been made to account for it on a former occasion ('British and Foreign Medico-Chirurgical Review,' July, 1870).

It is when we begin to consider the diseases of the thorax, and still more those of the abdomen, that the sort of influence

on the mind, which produces real 'mental symptoms of ordinary disease,' is typified. The words *Hysteria* and *Hypochondriasis* at once suggest the idea of that curious sympathy of the disposition with states of the organs of vegetative life, which is a matter of common observation, and is itself even regarded as a manifestation of 'ordinary' disease, but is, nevertheless, truly mental, and, in its exaggerated forms, produces actual insanity.

The thoracic organs produce less marked effects in their diseased state, than the abdominal, but it is questionable whether they are less constant. Disease of the heart ought hardly to be spoken of in a general way, since, no doubt, different sorts of it have different psychical accompaniments; nevertheless, there is a certain super-mobility, as it were, of the disposition, a quick sanguine feeling for one moment, followed by an exhausted depression, and often a considerable amount of restless anxiety coupled, as far as I have been able to observe with most varieties. A patient, with aortic regurgitant disease, very recently affirmed to me that the only time she had felt her heart inconveniently, was on two occasions, when violent palpitation had been accompanied by what she herself described as a bad hysterical fit. She herself had, however, something of the anxious manner just referred to.

Diseases of the lungs do not appear to possess, in virtue of their site, any influence over the mental powers. Neither bronchitis, pneumonia, nor pleurisy has ever been charged with causing either despondency or exaltation, as have the liver, the spleen, or the heart. In the case of phthisis, the curious hopefulness, the unwillingness to believe in the approach of death, which, no doubt, frequently occurs, is probably in part a real reproach cast by nature upon modern therapeutics. It is undoubtedly the case that the strange belief (as it was thought to be) of many phthisical patients that their recovery was still possible, is beginning rapidly to find an echo in the medical creeds of physicians. On the other hand, it must be remembered that blood, from which tubercle is deposited, appears to have that peculiar injurious property for the brain which excites delirium. This is especially marked in the delirious variety of acute phthisis, and also in the last stages of galloping consumption, as in the case of S—— M——, a widow, æt. 47, occupied

in hawking, who was brought to the West Riding Asylum on account of her wild ravings, and died a fortnight after admission of the phthisis of which these ravings were symptomatic. As for the 'phthisical insanity' which has been affirmed to exist, it is a very great question whether it should not rather be called and regarded as 'Asylum phthisis,' rather than treated as a form of mental aberration depending on disease in the lung.

The abdominal organs have long been regarded as closely connected with the workings of the disposition. It is needless to quote instances of this connection; our information on the subject rather requires collecting and systematizing than additional illustration, and there is not space left for any attempt at such a labour here. The depression and irritability of dyspepsia are known to every medical man. In the case of G—— W——, married, æt. 30, piece wrapper, recently under my care, the depression was most marked, both in appearance, behaviour, and in speech. He had been affected with severe vomiting about twice a week for eight years. Again, an old man, R—— M——, was affected with cancer of the peritoneum very extensively, and depression of spirits was in his case very marked, indeed he never seemed to be in any sort of spirits. In a very obscure case of sudden abdominal pain, with symptoms of collapse, in which I was consulted, the patient appeared to rally in every respect, except that his manner was of the most anxious and depressed kind, so much so as to excite suspicion of a sudden access of hypochondria. He died suddenly one evening about a week after the first illness, with a renewal of the old symptoms; the only rational explanation of these symptoms that presented itself was that of a rupture of the gall-bladder.

Diseases of the generative organs, such as orchitis, produce a marked depressing effect on the mind. The hysteria of the female, when resulting, as it no doubt often does, from disease of the ovaries, uterus, or connected parts, is also a mark of depressed mental power, and is very analagous to the mental symptoms of spermatorrhœa in the male, which also, when they become exaggerated into insanity, frequently take the form of a false show of power. The urinary organs have also some amount of influence over the psychical life, for the time being, as is well



illustrated by a case communicated to me by Mr. Aldridge, of the West Riding Asylum, in which, by removing from the bladder of a woman, admitted in a maniacal state, a very large quantity of offensive urine (amounting to three pints) seven hours' sleep was procured, the patient being affirmed not to have slept for twelve days before. In Bright's disease, however, the mind appears to remain quite unaffected.

There is not wanting evidence that diseases of the skin sometimes have a connection with mental states. The separation made by Dr. Purdon, of Belfast, of seven varieties as 'Neurotic Skin Diseases,' is now well known, and commonly assented to, and, further, there are the singular mental manifestations accompanying pellagra to be considered.

'General diseases' may be supposed to operate on the mind, through their action on the convolitional grey centres, among other organs. This is typified in the production of the delirium of fevers. Some of these diseases, such as cancer, diabetes, and scurvy, appear to have a more special relation to the mental faculties. A very interesting case was mentioned to me by Dr. Crichton Browne, in which, on cancerous invasion of the brain taking place, a marked abatement took place in the violence of the symptoms of insanity, which had before shown themselves in a constant wilfulness, and a sulky and mischievous character of the disposition.

In looking back on what has been said regarding the psychical influence of different diseased organs, it will be seen what a vast field of research is here opened up, in these days a field all the more important since every disease seems to seize upon the nervous centres by any possible path, and the sthenic type of disease is, in many directions, giving way to the nervous. The little that has been done in this field of work, has not received justice here, but, for all that, it is certain that little *has* been done. The necessities of the future will probably direct additional enterprise in this direction.

We started, it must be remembered, with the hypothesis that all men's minds are equal to one another. The fact that nature has, in reality, arranged the matter quite otherwise, complicates very much the estimation of the mental effect of a given disease. The minds which disease has to work on are not all coins stamped



with the same die. On the contrary, there is exhibited in mental capacity and disposition a transition as great as that from the man to the polyp, viz., that from the genius to the idiot. Between these two, between the being who rules and moulds external circumstances, and the being who is utterly indifferent to almost all that passes around him, all men stand arranged on two sides of a boundary line (by no means a mathematical one), according as they are affected by surrounding events. On the one side are those strong enough, mentally, to bear all the fatigues and crosses of life, and reap an average amount of its pleasures; on the other side those too weak for the life they are born into, persons agitated and fretted by every little cross that happens, and over-excited by every pleasure. Sooner or later, in their own persons or in their descendants, the cloud of insanity descends upon minds of the latter sort; their owners constitute the inmates of our lunatic asylums.

The external circumstances, of which we have just spoken, are not confined to mental frets and crosses; it is a fact well observed, that diseases in the bodies of persons, predisposed to insanity, have also no inconsiderable influence in disturbing the mental equilibrium. As an extreme instance of this, we may notice a case, that of E—— T——, admitted into the West Riding Asylum on January 6th, 1872, whose father died of paralysis, and whose first attack of insanity took place after the amputation of a thumb! It will, therefore, be readily intelligible when we affirm that *any* disease may produce insanity in a person predisposed in that direction. But all the more will this effect be brought about when the organ, in which the morbid process proceeds, has a special relation to the psychological life. Such conclusions, regarding different organs, as have been presented here, do not, therefore, lose their value on account of the inequality of mental endowment. It still remains the truth that the weaker the mind, the more readily will it be influenced by bodily diseases, the more readily, too, as the cerebral sympathies of the diseased organ are stronger, and the stronger the mind the more extensive and complicated must the disease be, and the more psychically influential the diseased organs, in order to overturn healthy mental action.

# THE ELECTRIC TREATMENT OF THE I N S A N E .

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It is with a feeling of more than diffidence, that I fulfil my promise to write some remarks upon the results of the use of electricity in the treatment of the insane. So great an investigation can only be slowly worked out, and that I have no great disclosures to make is not a matter for much surprise or regret. My diffidence is due rather to the fact that the few remarks I find myself able to make are based mainly upon the labours of others rather than upon my own. The aid and encouragement I have received from Dr. Crichton Browne, and the daily attention of Dr. Major, and the other resident officers of the West Riding Asylum, have put me in position to write a paper which more properly should have come from themselves

In the general practice of electro-therapy I have been engaged rather extensively for some years, and have thereby gained a certain insight into its working in ordinary cases. Of its action upon the insane, however, I was wholly ignorant; nor could I discover that any other physician knew more than myself. Among the patients of an asylum, which is mostly, indeed, a hospital for nervous diseases, I anticipated that electro-therapy should find an extensive field of usefulness, and with this view I proceeded to enlist my friend Dr. Crichton

Browne in the cause. Dr. Browne took up both my suggestions and myself with his usual intelligence and generosity; he ordered at once the necessary apparatus, allowed me to avail myself of the able assistance of Dr. Major, and gave me the free run of his patients.

My chief desire was to ascertain the value of the continuous current in insanity; from faradism I did not expect very much. For the purposes of the continuous current, Dr. Browne obtained one hundred cells of Muirhead's modification of Daniell's battery, as manufactured by Messrs. Elliott. This instrument we have had in use at the Leeds Infirmary for some time. In the Infirmary, however, it tends to fall into some neglect, as the portable battery, made by M. Foveaux, of Messrs. Weiss and Sons, is found, in practice, to be more useful;<sup>1</sup> in the Asylum, however, we are almost always able to bring our patients to the battery. Troublesome at the best are all batteries with which I am acquainted; those which can give off a considerably quantity of electricity, without rapid exhaustion, require continuous attention and recharging, while those which need less attention, such as the Leclanché cell, seem to be so soon exhausted as to be unfit for prolonged sittings. For use in my own private house, I have had both Foveaux's battery, and Stöhrer's largest battery; either of them will be found as satisfactory as any in this mortal life, but they are far from perfect. Muirhead's instrument in the present instance, however, was fixed upon as the best under the circumstances, and, when it was complete, Dr. Major and myself selected a number of patients upon whom to work. We could find little or nothing to guide us in this special inquiry, the only contributions with which I was acquainted being a paper by Arndt, in 'Greisinger's Archiv,' for 1870, and some notes of five cases treated by Benedict, which appeared in several journals, but which scarcely claim or deserve much attention. Arndt's paper is a more adequate effort to obtain some light and knowledge, but instead of setting to work upon his patients, according to some simple and uniform plan, German as he is, he begins by

<sup>1</sup> I may state, incidentally, that M. Foveaux, at my suggestion, has made these batteries to contain as few as 15 cells; small instruments, which are very useful for simple cases of neuralgia.

proposing a complex hypothesis, and tests its truth by a series of experiments. In so dark a matter as ours, we do best to start with as little scaffolding of hypothesis as possible, contenting ourselves with a few plain outlines of method. Thus groping in the dark we may hit off a way, or get at some suggestive results, which no ingenuity could have anticipated. This course is the more necessary, for as yet the very foundations of electro-therapy in physiology are ill-laid or rather little known. Throughout the whole of Arndt's somewhat tedious physiological introduction, there run several important errors, his views of the present state of our knowledge of electrotonus being especially erroneous. To my mind an adequate knowledge of the polar method of Brenner, would have cleared his mind on this and other points of difficulty, but, I think, in a practical essay, all such abstract considerations are better avoided. In our own inquiry, we thought it better to act only on the supposition, which Erb has raised to a certainty, that a current can be passed in any direction through the brain; and on the further supposition, still far from a certainty, that the sympathetic system may be definitely and efficiently reached in the neck, and that such influence will be felt in other and distant parts of the body whither that system is distributed.<sup>1</sup> Taking these two simple methods as our starting points, and forming no theories and no anticipations beyond them, we selected a few patients from the various classes of the insane and watched what effects, if any, were obtained. The cases selected, in the first instance, numbered about 20 or more, but of these several fell off as unfitted, in one way or another, for the treatment. The cases which remained continuously under treatment, however, belonged to the categories of Brain Wasting, Mania, Dementia, and Melancholia. Electricity, like all other

<sup>1</sup> Concerning these questions, I may refer to an article in the 'B. & F. Med. Chir. Rev.,' for July, 1871, which has been somewhat widely criticised, in several instances very kindly. Among the arguments brought against my doubts concerning the electrization of the sympathetic, I have been asked triumphantly how I account for dilatation of the pupils when the neck is included in a strong current? I do not deny that the sympathetic nerve may be thus generally involved in the influence, but I am also aware that dilatation of the pupils follows sharp electrization of any sensitive part of the body, from the crown of the head to the soles of the feet.

medicines, finds itself almost powerless in the presence of progressive organic disease; we selected one good case, however, of brain wasting on which to test its action, the patient, N. N., being quite intelligent enough to understand his own condition and the progressive enfeeblement of all his powers; he was also intelligent enough to estimate fairly the value of the treatment which he received. The continuous current was regularly applied to the head for some time, but with so little good result that we were not encouraged to pursue the method further in this class of cases. How far faradism may benefit such patients is a subject for our further inquiry.

The following are the notes of N. N.'s case, as given by Dr. Major:—

N. N., ætat. 44, admitted December 29th, 1871. A typical case of chronic brain wasting, characterised, mentally, by slight impairment of memory and depression. Bodily, by pallor of the face, slight inequality of the pupils, and unsteadiness of gait.

May 14th: Continuous current sent through the head; No. of cells, 5-20; duration 10 minutes. Result: Sense of constriction complained of in the head flushing of the cheeks and ears. No mental change.

May 15th: Current sent through the head; No. of cells, 5; duration 10 minutes. Result: Slight flushing; slight feeling of giddiness; pulse somewhat irregular. No mental change, and no alteration in power of locomotion.

May 16th: Current sent through the head; No. of cells, 5; duration 10 minutes. Result: Very sensitive to the current. No change observed.

May 17th: Current sent through the head; No. of cells, 5; duration 10 minutes. Result: No change.

May 18th: Current sent through the head; No. of cells, 5-15; duration 10 minutes. Result: No change.

May 20th: Current sent through the head; No. of cells, 5-10; duration 10 minutes. Result: Very sensitive to current; none of the ordinary effects, such as flushing, giddiness, is observed; pulse unaffected; no mental change; locomotion unimproved.

May 21st: Current sent through the head; No. of cells, 5; duration 10 minutes. Result: No change.

May 22nd: Current sent through the head; No. of cells, 5; duration 10 minutes. Result: Slight flushing and giddiness; no mental change; locomotion not improved.

May 23rd: Current sent through the head: No. of cells, 5-10; duration 10 minutes. Result: Slight flushing; no giddiness; no further change.

May 24th: Current sent through the head; No. of cells, 10; duration 10 minutes. Result: Slight flushing and giddiness; no change mentally; locomotion unimproved.



May 25th : Current sent through the head ; No. of cells, 5 ; duration 10 minutes. Result : Very sensitive to current ; slight flushing and giddiness.

May 27th : Current sent through the head ; No. of cells, 5-10 ; duration 10 minutes. Result : No change.

May 28th : Current sent through the head ; No. of cells, 5-10 ; duration 10 minutes. Result : Patient states that he feels better after passage of the current, but there is no visible improvement ; on the contrary, his gait seems to be more unsteady than before.

May 29th : Current sent through the head ; No. of cells, 5-10 ; duration 10 minutes. Result : Pallor of the face ; much unsteadiness of gait.

May 30th : Current sent through the head ; No. of cells, 5-15 ; duration 10 minutes. Result : No change.

May 31st : Current sent through the head ; No. of cells, 5-10 ; duration 10 minutes. Result : No change mentally ; locomotion unimproved.

June 1st : Current sent through the head ; No. of cells, 5 ; duration 10 minutes. Result : No further change.

June 3rd : Current sent through the head ; No. of cells, 5-10 ; duration 10 minutes. Result : Pain in head before complained of diminished ; slight flushing ; gait decidedly less steady ; says he feels weaker.

June 4th : Current sent through the head ; No. of cells, 5-10 ; duration 10 minutes. Result : Flushing ; is looking somewhat better than on last occasion ; walks more steadily and is free from pain.

June 5th : Current sent through the head ; No. of cells, 5-10 ; duration 10 minutes. Result : No further change.

June 6th : Current sent through the head ; No. of cells, 5-10 ; duration 10 minutes. Result : No change mentally ; locomotion unimproved.

June 7th : Current sent through the head ; No. of cells, 5 ; duration 10 minutes. Result : No change.

June 8th : Current sent through the head ; No. of cells, 5 ; duration 10 minutes. Result : Mind continues comparatively clear, but unsteadiness of gait still more marked.

June 10th : Current sent through the head ; No. of cells, 5-10 ; duration 10 minutes. Result : No further change.

June 11th : Current sent through the head ; No. of cells, 5-10 ; duration 10 minutes. Result : Greater relative sensitiveness to the current is observed in the antero-posterior direction compared with the effect through the temples ; no further change.

June 12th : Current sent through the head ; No. of cells, 5-10 ; duration 10 minutes. Result : No further change.

June 13th : Current sent through the head ; No. of cells, 5 ; duration 10 minutes. Result : Mentally no change is observed, but, as regards bodily condition, patient is weaker, and locomotion less steady.

June 14th : Current sent as before ; No. of cells, 5-10 ; duration 10 minutes. Result : No further change ; on the whole, therefore, as regards strength and power of locomotion, patient is worse ; mentally no change is observed.

In melancholia, again, our results with the continuous current were not such as to encourage us to make any more extensive use

of electro-therapy—not, at any rate, in the form of the continuous current applied to the head or neck. Dr. Major tried these methods carefully and repeatedly, but could not observe the least improvement, nor could I, at my periodical visits, find grounds for any more hopeful arguments concerning these distressing cases. I select three cases of melancholia in which the treatment was fully tried. The notes, as in all the other cases, are from Dr. Major's case books :—

T. H. S., ætat. 38, admitted March 23rd, 1872. Case of hypochondriacal melancholia. Second attack. Treated by opium, but with no improvement in the mental symptoms.

May 17th : Continuous electrical current sent from occiput to forehead, and also through the sympathetics in the neck ; No. of cells, 5-10 ; duration 10 minutes. Result : Pallor of the face, accompanied by a general feeling of chilliness ; no giddiness ; no mental change.

May 18th : Current sent through the head, and through the sympathetics in the neck ; No. of cells, 5-10 ; duration 10 minutes. Result : No change observed.

May 20th : Current sent through the head, and through the sympathetics in the neck ; No. of cells, 5-15 ; duration 10 minutes. Result : No change.

May 21st : Current sent through the head, and through sympathetics in the neck ; No. of cells, 5-15 ; duration 10 minutes. Result : Slight flushing of the face and giddiness ; pupils unaffected ; no mental change.

May 22nd : Current sent through the head and sympathetics in the neck ; No. of cells, 5 ; duration 10 minutes. Result : Very sensitive to current ; slight flushing and giddiness induced ; No mental improvement.

May 23rd : Current sent through the head ; No. of cells, 5-10 ; duration 10 minutes. Result : Slight flushing ; no giddiness ; no further change bodily or mentally.

May 24th : Current sent through the head ; No. of cells, 10 ; duration 10 minutes. Result : Flushing of the face and giddiness ; no effect on rate of pulse ; no mental change.

May 25th : Current sent through the head ; No. of cells, 5-15 ; duration 10 minutes. Result : Flushing of the face and slight giddiness ; no mental improvement.

May 27th : Current sent through the head ; No. of cells, 5-10 ; duration 10 minutes. Result : Very sensitive to current, especially when sent through the anterior cerebral lobes ; no further effect observed.

May 28th : Current sent through the head ; No. of cells, 5-15 ; duration 10 minutes. Result : No change.

May 29th : Current sent through the head ; No. of cells, 5-10 ; duration 10 minutes. Result : Flushing of the face and giddiness ; the general result, so far, seems to be the reverse of favourable ; patient is looking paler, and his delusions, founded on his sensations, seem to be increased.

May 30th : Current sent through the head ; No. of cells, 5-20 ; duration 10 minutes. Result : No further change.

May 31st : Current sent through the sympathetics in the neck ; No. of cells, 5-15 ; duration 10 minutes. Result : Slight flushing ; no giddiness ; pupils unaffected ; no mental improvement.

June 1st : Current sent through the sympathetics in the neck ; No. of cells, 5-15 ; duration 10 minutes. Result : Slight flushing of the face and neck ; no giddiness ; no effect on the pupils ; mentally patient is more depressed, and, as regards bodily condition, he is both thinner and paler than before ; electricity to be discontinued.

J. D., ætat. 40, admitted April 13th, 1870. Case of melancholia. Second attack. Three months previous to admission became excited, and this, in the course of five or six weeks, was succeeded by mental depression and muteness.

May 31st : Current sent through the head ; No. of cells, 5-10 ; duration 10 minutes. Result : Very sensitive to current, but no bodily change observed ; no change mentally.

June 1st : Current sent as before ; No. of cells, 5 ; duration 10 minutes. Result : As yet no change ; Patient is very stupid, maintains a careless and slovenly attitude, and will not utter a word.

June 3rd : Current sent as before ; No. of cells, 5-10 ; duration 10 minutes. Result : *Nil*.

June 4th : Current sent as before ; No. of cells, 5-10 ; duration 10 minutes. Result : Slightly less stolid looking, but otherwise no change.

June 6th : Current sent as before ; No. of cells, 5-10 ; duration 10 minutes. Result : No immediate effect. Yesterday patient spoke a little ; he had not previously done so for some weeks.

June 7th : Current sent as before ; No. of cells, 5-10 ; duration 10 minutes. Result : Can stand 10 cells when applied to the lower frontal region, but cannot bear it when applied slightly higher up ; this happens invariably ; no mental change.

June 8th : Current sent as before ; No. of cells, 5-15 ; duration 10 minutes. Result : No change.

June 10th : Current sent as before ; No. of cells, 5-15 ; duration 10 minutes. Result : No change.

June 11th : Current sent as before ; No. of cells, 5-10 ; duration 10 minutes. Result : Patient continues to look somewhat less sluggish than before, but with the exception of the occasion before referred to has not spoken.

June 12th : Current sent as before ; No. of cells, 5-10 ; duration 10 minutes. Result : No further change.

June 13th : Current sent as before ; no change.

June 14th : Current sent as before ; No. of cells, 5-15 ; duration 10 minutes. Result : On the whole, only a slight change ; still patient does not look so stolid as before, is somewhat quicker in his movements, and seems to take more notice of what is going on ; he does not speak.

J. E. G., ætat. 19, admitted March 1st, 1872. Case of hypochondriacal melancholia of about 5 years duration. Treated by opium, and at first with benefit, but of late he has become worse.

May 14th : Continuous current sent through the head ; No. of cells, 5-20 ; duration 10 minutes. Result : No change.

May 15th : Current sent through the head, and through the sympathetics in the neck ; No. of cells, 5-10 ; duration 10 minutes. Result : Slight flushing and giddiness ; pulse slightly irregular.

May 16th : Current sent through the head, and through the sympathetics in the neck : No. of cells, 5-15 ; duration 10 minutes. Result : Slight pallor and feeling of giddiness ; pulse slightly intermittent.

May 17th : Current sent through the head ; No. of cells, 5 ; duration 10 minutes. Result : Some flushing ; a feeling of tightness in the head ; pulse regular ; no mental change.

May 18th : Current sent through the head ; No. of cells, 5 ; duration 10 minutes. Result : Slight flushing and feeling of giddiness, but not sufficient to cause staggering.

May 21st : Current sent through the head and sympathetics ; No. of cells, 5-10 ; duration 10 minutes. Result : Very sensitive to current ; slight flushing ; no change in the pupils ; no mental change.

May 22nd : Current sent through head and sympathetics in the neck ; No. of cells, 5 ; duration 10 minutes. Result : Slight flushing ; no giddiness ; no further change.

May 23rd : Current sent through the head and sympathetics in the neck ; No. of cells, 5-10 ; duration 10 minutes. Result : Slight flushing ; no improvement mentally.

May 24th : Current sent through the head ; No. of cells, 5-10 ; duration 10 minutes. Result : No change.

May 25th : Current sent through the head ; No. of cells, 5-15 ; duration 10 minutes. Result : Slight flushing and giddiness ; no mental change.

May 27th : Current sent through the head ; No. of cells, 5 ; duration 10 minutes. Result : Slight flushing ; no mental or other change observed.

May 28th : Current sent through the head ; No. of cells, 5-20 ; duration 10 minutes. Result : No change.

May 29th : Current sent through the head ; No. of cells, 5-10 ; duration 10 minutes. Result : flushing of the face ; no mental change.

May 30th : Current sent through the head ; No. of cells, 5-20 ; duration 10 minutes. Result : No change.

May 31st : Current sent through the head ; No. of cells, 5-10 ; duration 10 minutes. Result : Slight flushing ; no mental or other change.

June 1st : Current sent through the sympathetics in the neck ; No. of cells, 5-10 ; duration 10 minutes. Result : Flushing ; no giddiness ; no improvement mentally.

June 3rd : Current sent through the head ; No. of cells, 5-10 ; duration 10 minutes. Result : Dimness of vision complained of ; patient is more sensitive to the current when sent through the temples than antero-posteriorly ; no mental change.

June 5th : Current sent through the sympathetics in the neck ; No. of cells, 5-15 ; duration 10 minutes. Result : Flushing ; pupils unaffected ; much more sensitive to the current through the neck than through the head ; seems slightly improved mentally.

June 6th : Current sent through the sympathetics in the neck ; No. of cells, 5-15 ; duration 10 minutes. Result : Slight flushing ; pupils unaffected ; no further change.

June 7th : Current sent through sympathetics in the neck ; No. of cells, 5-20 ; duration 10 minutes. Result : Flushing ; on the whole slightly less depressed mentally, but change as yet not great.

June 8th : Current sent through the head ; No. of cells, 5 ; duration 10 minutes. Result : Much depressed to-day ; very sensitive to current, but no further effect observed.

June 10th : Current sent through sympathetics in the neck ; No. of cells, 5-10 ; duration 10 minutes. Result : Flushing ; no effect on pupils ; no change mentally.

June 11th : Current sent through the sympathetics in the neck ; No. of cells, 5-10 ; duration 10 minutes. Result : Flushing ; pupils unaffected ; no mental improvement.

June 12th : Current sent through sympathetics in the neck ; No. of cells, 5-10 ; duration 10 minutes. Result : Flushing ; pupils unaffected ; slightly less depressed mentally.

June 13th : Current sent through sympathetics in the neck ; No. of cells, 5-10 ; duration 10 minutes. Result : No change.

June 14th : Current sent through sympathetics in the neck ; No. of cells, 5-20 ; duration 10 minutes. Result : No further change ; on the whole little change is observed one way or the other ; there is no permanent improvement.

Here again the use of the continuous current applied to other parts of the body has as yet to be investigated. We propose to try the treatment applied in some cases, say, to the liver, in others to the ovaries, and so on according to the circumstances of each. Faradism also has to be tried in melancholia.<sup>1</sup>

In mania, the use of the current to the head or neck seems likely to be of advantage. It is difficult to obtain cases of mania exactly suitable for investigation, for, of course, cases in the way of recovery, or likely to have approaching periods of quiescence, are unfit for the purpose of testing a new remedy. We need further evidence under this head, as the only good and definite cases which were treated by us are the following, which almost speak for themselves :—

A. S., ætat. 24, admitted April 27th, 1872. Case of sub-acute mania, characterised by incoherence, with a restless and irrational manner. Treated by Conium, but with little effect.

May 15th : Current sent through the head ; No. of cells, 5-20 ; duration

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<sup>1</sup> It is, perhaps, worth noting that M. S., the subject of religious atonic melancholia, suddenly recovered, throwing the whole disease off like a garment four or five days after the electric treatment had been given up. It is possible that the result of that treatment may have been to put her in a position thus to cast off her ailment. It is, on the other hand, fortunate that this rare event did not occur during the treatment, or we might have been seriously misled.



10 minutes. Result : Distinct increase of excitement ; no further effect observed.

May 16th : Current sent through the head ; No. of cells, 5 ; duration 10 minutes. Result : Very sensitive to current ; increase of excitement amounting to violence ; pain in the head complained of.

May 17th : Current sent through the head ; No. of cells, 5-10 ; duration 10 minutes. Result : Very much quieter and more rational during the passage of the current ; very sensitive to current, but no giddiness, &c.

May 18th : Current sent through the head ; No. of cells, 5-15 ; duration 10 minutes. Result : Considerably quieter ; more rational and coherent ; no giddiness, flushing, &c.

May 20th : Current sent through the head ; No. of cells, 5-15 ; duration 10 minutes. Result : No further change.

May 22nd : Current sent through the head ; No. of cells, 5 ; duration 10 minutes. Result : Very sensitive to current ; no further effect bodily or mentally.

May 23rd : Current sent through the head ; No. of cells, 5-10 ; duration 10 minutes. Result : No change.

May 24th : Current sent through the head ; No. of cells, 5-10 ; duration 10 minutes. Result : On the whole, patient is quieter and more rational.

May 25th : Current sent through the head ; No. of cells, 5-10 ; duration 10 minutes. Result : Pallor of the face ; patient continues somewhat quieter and more rational.

May 27th : Current sent through the head ; No. of cells, 5-10 ; duration 10 minutes. Result : No change.

May 28th : Current sent through the head ; No. of cells, 5-20 ; duration 10 minutes. Result : No further change.

May 29th : Current sent through the head ; No. of cells, 5-10 ; duration 10 minutes. Result : No change.

May 30th : Current sent through the head ; No. of cells, 5-20 ; duration 10 minutes. Result : No change.

May 31st : Current sent through the head ; No. of cells, 5-10 ; duration 10 minutes. Result : No change.

June 1st : Current sent through the head ; No. of cells, 5 ; duration 10 minutes. Result : No mental change.

June 3rd : Current sent through the head ; No. of cells, 5 ; duration 10 minutes. Result : Quieter and more rational.

June 4th : Current sent through the head ; No. of cells, 5 ; duration 10 minutes. Result : Considerably quieter and more rational in manner.

June 5th : Current sent through the head ; No. of cells, 5-10 ; duration 10 minutes. Result : No further change.

June 6th : Current sent through the head ; No. of cells, 5-10 ; duration 10 minutes. Result : Quiet, although at times incoherent ; patient is improved, and has in a great manner lost his grotesque and restless manner.

June 7th : Current sent through the head ; No. of cells, 5 ; duration 10 minutes. Result : Decidedly quieter in manner, and somewhat more rational.

June 8th : Current sent through the head ; No. of cells, 5 ; duration 10 minutes. Result : Patient is still talkative and irrational, but much less restless and now sits quietly, while formerly he was in constant motion.

June 10th : Current sent through the sympathetics in the neck ; No. of cells, 5-10 ; duration 10 minutes. Result : Continues quieter and more rational.

June 11th : Current sent through the sympathetics in the neck ; No. of cells, 5-10 ; duration 10 minutes. Result : No further change.

June 12th : Current sent through the sympathetics in the neck ; No. of cells, 5 ; duration 10 minutes. Result : Flushing ; no effect on the pupils ; continues fairly quiet.

June 13th : Current sent through the sympathetics in the neck ; No. of cells, 5-10 ; duration 10 minutes. Result : No further change.

June 14th : Current sent through the head ; No. of cells, 5-15 ; duration 10 minutes. Result : Manner and bearing decidedly quieter and more rational, but his conversation is still loose, and at times incoherent.

July 15th : Is now quite convalescent.

S. H., ætat. 49, admitted April 1st, 1872. Case of mania (sub-acute). Second attack.

May 15th : Current sent through the head ; No. of cells, 5-15 ; duration 10 minutes. Result : Distinct increase of excitement ; flushing, with a feeling of tension and giddiness.

May 16th : Current sent through the head ; No. of cells, 5-10 ; duration 10 minutes. Result : First, increase of excitement, followed by calmness ; slight flushing and giddiness.

May 17th : Current sent through the head ; No. of cells, 5 ; duration 10 minutes. Result : Increase of excitement, followed very shortly by calmness and quietude, which continues during the passage of the current, the restless and talkative manner being resumed at its close.

May 18th : Current sent through the head ; No. of cells, 5-10 ; duration 10 minutes. Result : Pallor of the face and slight giddiness ; perfectly calm during the passage of the current, though talkative and incoherent before and after.

May 20th : Current sent through the head ; No. of cells, 5-15 ; duration 10 minutes. Result : Quiet during the passage of the current, previously being restless and talkative ; slight flushing ; no giddiness.

May 21st : Current sent through the head ; No. of cells, 5-10 ; duration 10 minutes. Result : Slight giddiness and flushing ; no mental change.

May 22nd : Current sent through the head ; No. of cells, 5 ; duration 10 minutes. Result : Increase of excitement ; slight giddiness.

May 23rd : Current sent through the head ; No. of cells, 5 ; duration 10 minutes. Result : Very sensitive to current ; quiet during its passage, but when finished resumed her usual restless and talkative manner.

May 24th : Current sent through the head ; No. of cells, 5-10 ; duration 10 minutes. Result : Quiet during the passage of current, but effect not lasting.

May 25th : Current sent through the head ; No. of cells, 5-10 ; duration 10 minutes. Result : No bodily effect, but mentally there seems to be some improvement ; she is very quiet and composed.

May 27th : Current sent through the head ; No. of cells, 5-10 ; duration 10 minutes. Result : No further change.

May 28th : Current sent through the head ; No. of cells, 5-20 ; duration 10 minutes. Result : Slight increase in excitement ; no further change.

May 29th : Current sent through the head ; No. of cells, 5-10 ; duration 10 minutes. Result : Quietness ; slight flushing.

May 30th : Current sent through the head ; No. of cells, 5-15 ; duration 10 minutes. Result : No change.

May 31st : Current sent through the head ; No. of cells, 5-10 ; duration 10 minutes. Result : Quiet during the passage of the current, talkative and restless manner being resumed afterwards ; slight flushing, but no giddiness.

June 1st : Current sent through the head ; No. of cells, 5-10 ; duration 10 minutes. Result : Flushing of the face and slight increase in excitement ; No giddiness.

June 3rd : Current sent through the head ; No. of cells, 5-10 ; duration 10 minutes. Result : Much quieter during the passage of current, but the effect is very transient ; slight flushing.

June 5th : Current sent through the head ; No. of cells, 5-10 ; duration 10 minutes. Result : Slight flushing ; no further change.

June 6th : Current sent through the head ; No. of cells, 5-10 ; duration 10 minutes. Result : No change.

June 7th : Current sent through the head ; No. of cells, 5-10 ; duration 10 minutes. Result : Decidedly quieter in manner than formerly, but excitement, as manifested by her language, continues.

June 8th : Current sent through the sympathetics in the neck ; No. of cells, 5-10 ; duration 10 minutes. Result : Still talkative, but decidedly more rational than formerly ; at times, however, noisy and troublesome. Much flushing usually induced in this case.

June 10th : Current sent through the head ; duration 5 minutes. Result : More excited to-day, but fairly rational and coherent.

June 11th : Current sent through the sympathetics in the neck ; No. of cells, 5-10 ; duration 10 minutes. Result : Flushing, though at times much quieter and more rational ; the improvement on the whole not great.

June 12th : Current sent through the sympathetics in the neck ; No. of cells, 5-10 ; duration 10 minutes. Result : Patient is decidedly quieter and more rational.

June 13th : Current sent through the sympathetics in the neck ; No. of cells, 5-10 ; duration 10 minutes. Result : Patient is decidedly somewhat better, being more rational and quieter in her manner generally.

June 14th : Current sent through the head ; No. of cells, 5-15 ; duration 10 minutes. Result : Somewhat improved, being decidedly quieter in manner, and her conversation on the whole more rational.

So far, then, as the treatment of mania has been tested, it would seem that the immediate effect of the current applied directly to the brain is to tranquillize, this tranquillity being followed by some temporary increase of excitement ; and that the continued use of the current in this way tends on the whole to bring about a gradual cure. It does not seem probable that the mere astonishment caused by the process is the means by which this tranquillity is induced, as the effect does not lessen on

the repetition of the process, nor have other equally strange processes a like effect, but the reverse.

It is, however, under the head of acute dementia, as we might anticipate, that we find the best results are recorded. Something to arouse the dormant energies of an essentially sound but apathetic brain seems required, and electricity would appear to be such an agent. Whether the continuous current acts specifically or whether faradism of the head or even of remoter parts would act as well, remains to be seen.

The following cases of dementia were treated fully, by the application of the continuous current to the head or neck :—

E. T., *ætat.* 16, admitted January 6th, 1872. Case of acute primary dementia, supervening on an accident which occurred about ten months previously, and which occasioned the loss of patient's right thumb. On admission, in addition to dementia, some excitement was present, and, from time to time, choreaic movements manifested themselves. Patient treated with large doses of quinine, but the symptoms continued but little changed.

May 15th : Continuous electrical current sent from occiput to forehead and through the temples ; No. of cells, 5 ; duration 12 minutes. Immediate result : Slight flushing of the face ; diminution of the blue colour of the hands, with increase in the temperature ; more intelligent after the operation.

May 16th : Current sent from occiput to forehead, and from side to side ; duration 10 minutes. Result : Decided rousing and increased intelligence ; slight giddiness, with flushing of the face ; pulse regular.

May 17th : Current sent from occiput to forehead, and from side to side, through temples and above the ears ; No. of cells, 5 ; duration 10 minutes. Result : Increase of temperature generally, and most marked in the hands ; a feeling of drowsiness shortly after passage of current ; improvement continues.

May 18th : Current sent from occiput to forehead, and through the temples ; No. of cells, 5-10 ; duration 10 minutes. Result : No flushing, &c., observed ; still the drowsy feeling after passage of current ; improvement mentally continues.

May 20th : Current sent through the head ; No. of cells, 5-10 ; duration 10 minutes. Result : No immediate result observed ; the improvement before noticed continues.

May 21st : Current sent through the head ; No. of cells, 5 ; duration 10 minutes. Result : Slight giddiness produced ; otherwise no change.

May 22nd : Current sent through the head ; No. of cells, 5 ; duration 10 minutes. Result : Slight giddiness ; no mental change since last report.

May 23rd : Current sent through the head ; No. of cells, 5-10 ; duration 10 minutes. Result : Patient is very sensitive to the current ; no immediate effect observed ; improvement generally continues.

May 24th : Current sent through the head ; No. of cells, 5-10 ; duration 10 minutes. Good effect, mentally, very marked ; patient is more intelligent and



quicker in her movements ; answers questions rationally and well ; the tendency to sleep, after each application, is still observed.

May 25th : Current sent through the head ; No. of cells, 5 ; duration 10 minutes. Result : No bodily effect observed ; improvement, mentally, very noticeable.

May 27th : Current sent through the head ; No. of cells, 5-10 ; duration 10 minutes. Result : Slight giddiness and feeling of drowsiness ; no flushing, &c.

May 28th : Current sent through the head ; No. of cells, 5-10 ; duration 10 minutes. Result : No further change.

May 29th : Current sent through the head ; No. of cells, 5-10 ; duration 10 minutes. Result : No physical change ; improvement mentally continues.

May 30th : Current sent through the head ; No. of cells, 5-15 ; duration 10 minutes. Result : Flushing during the passage of the current ; drowsiness following.

May 31st : Current sent through the head ; No. of cells, 5-10 ; duration 10 minutes. Result : Continues very sensitive to the current ; no bodily effect ; improvement, mentally, continues, and is very marked.

June 1st : Current sent through the head ; No. of cells, 5 ; duration 10 minutes. Result : No further change noticed.

June 3rd : Current sent through the head ; No. of cells, 5 ; duration 10 minutes. Sleep induced almost immediately after passage of the current ; no flushing ; improvement continues.

June 4th : Current sent through the head ; No. of cells, 5 ; duration 10 minutes. Result : No change.

June 5th : Current sent through the sympathetics in the neck ; No. of cells, 5-15 ; duration 10 minutes. Result : Very sensitive to the current ; patient is now perfectly rational in manner and conversation.

June 7th : Current sent through the sympathetics in the neck ; No. of cells, 5 ; duration 10 minutes. Bodily effect very slight ; good result, mentally, continues. She is now lively and cheerful ; talks intelligently, and has gained 17 lb. in weight during the past month.

June 8th : Patient is now convalescent. Treatment discontinued.

Remarks : As regards the immediate effects of the process, the peculiarities in this case, as compared with the others, were :—Unusual sensitiveness to the current ; little flushing or giddiness induced, but a feeling of drowsiness and a tendency to sleep. The last named was not noticed as the improvement in the mental symptoms occurred.

W. A., ætat. 17, admitted January 23rd, 1872. Case of acute primary dementia, of about two-and-a-half years' duration. Treatment, Quinine Sulph. and Potass. Bromid., but without benefit.

May 14th, a.m. : Current sent through head, and through the sympathetics in the neck ; No. of cells, 5-25 ; duration 10 minutes. Result : Flushing of the face, but no apparent rise in temperature ; twitchings of the facial muscles occasionally present ; pupils unaffected (dilated) ; no immediate effect in rousing patient from his state of apathy.

May 14th, p.m. : Patient answered several questions after the passage of the current, while before he would not speak ; also described his sensations to a certain extent, and, altogether, is more intelligent.



May 16th : Current sent through the head ; No. of cells, 5-15 ; duration 10 minutes. Result : Distinct rousing of patient ; temperature of hands raised, and their blue colour much diminished ; pulse somewhat accelerated ; slight flushing of the face.

May 17th : Current sent through the head ; No. of cells, 5-10 ; duration 10 minutes. Result : As before, to rouse the patient and cause him to assume a more intelligent manner ; no flushing, giddiness, &c.

May 17th : Current sent through the head ; No. of cells, 5-10 ; duration 10 minutes. Result : Slight flushing ; increase in temperature of the hands ; no mental change.

May 20th : Current sent through the head ; No. of cells, 5-10 ; duration 10 minutes. Slight flushing induced ; no further change observed.

May 21st : Current sent through the head ; No. of cells, 5-15 ; duration 10 minutes. Result : More intelligent, and spoke better than before.

May 22nd : Current sent through the head ; No. of cells, 5-15 ; duration 10 minutes. Result : Decidedly more intelligent and quicker in his movements ; no bodily change observed.

May 23rd : Current sent through the head ; No. of cells, 5-20 ; duration 10 minutes. Result : No further change, but improvement generally continues.

May 24th : Current sent through the head ; No. of cells, 5-10 ; duration 10 minutes. Slight flushing induced ; the improvement mentally continues.

May 25th : Current sent through the head ; No. of cells, 5-20 ; duration 10 minutes. Result : Slight flushing of the face ; no further change.

May 27th : Current sent through the head ; No. of cells, 5-15 ; duration 10 minutes. Result : Flushing of the face ; patient continues somewhat improved ; now, when told, does as he is directed, understanding perfectly what is said.

May 28th : Current sent through the head ; No. of cells, 5-25 ; duration 10 minutes. Result : No further change.

May 29th : Current sent through the head ; No. of cells, 5-15 ; duration 10 minutes. Result : No change observed.

May 30th : Current sent through the head ; No. of cells, 5-15 ; duration 10 minutes. Result : No further change.

May 31st : Current sent through the head ; No. of cells, 5-15 ; duration 10 minutes. Result : Mental improvement, though not very great, is still quite perceptible, and continues.

June 1st : Current sent through the head ; No. of cells, 5-10 ; duration 10 minutes. Result : Flushing of the face ; increased heat of the hands ; no further change mentally.

June 3rd : Current sent through the head ; No. of cells, 5-15 ; duration 10 minutes. Result : No bodily change ; improvement generally continues.

June 4th : Current sent through the head ; No. of cells, 5-20 ; duration 10 minutes. Result : Before passage of the current patient was very stupid and would not speak ; effect of the current was to rouse him, so that he answered shortly but distinctly and rationally.

June 5th : Current sent through the sympathetics in the neck ; No. of cells, 5-20 ; duration 10 minutes. Result : Pupils unaffected (dilated) ; on increasing the current to 25 cells, face became suddenly and rapidly suffused ; this at once subsiding when the electrodes were removed.

June 6th : Current sent through the sympathetics in the neck ; No. of cells, 5-20 ; duration 10 minutes. Result : Some flushing ; pupils unaffected ; mental state about the same.

June 7th : Current sent through the sympathetics in the neck ; No. of cells, 5-20 ; duration 10 minutes. Result : Little bodily effect till the cells were increased to 25, when the sudden flushing, before described, occurred, and disappeared in the same manner.

June 8th : Current sent through the sympathetics in the neck ; No. of cells, 5-25 ; duration 10 minutes. Result : No flushing ; little change mentally, still, on the whole, he is more intelligent, and, at times, can make himself useful.

June 10th : Current sent through the head ; No. of cells, 5-10 ; duration 10 minutes. Result : No further change.

June 11th : Current sent through the sympathetics in the neck ; No. of cells, 5-25 ; duration 10 minutes. Result : Slight flushing ; pupils unaffected ; mental condition about the same.

June 12th : Current sent through the head ; No. of cells, 5-10 ; duration 10 minutes. Result : Slight flushing ; improvement generally continues.

June 13th : Current sent through the sympathetics in the neck ; No. of cells, 5-20 ; duration 10 minutes. Result : Flushing ; pupils unaffected ; improvement slow but continues.

June 14th : Current sent through the head ; No. of cells, 5-15 ; duration 10 minutes. Result : No further change.

July 4th : W. A. is now reported to be recovered (Dr. Crichton Browne).

M. W., ætat. 65, admitted March 26th, 1872. Case of dementia of about 8 months duration, characterised by a total loss of memory for recent events, those of her childhood very fairly retained.

May 14th : Current sent through the sympathetics in the neck ; No. of cells, 5-20 ; duration 10 minutes. Result : Very sensitive to current ; flushing, followed by giddiness, and a feeling 'as if she were drunk ;' mental symptoms unchanged.

May 15th : Current sent through the head ; No. of cells, 5 ; duration 10 minutes. Result : Apparently increased fullness of the thyroid gland ; flushing and rise in temperature ; no appreciable mental change.

May 16th : Current sent through the head ; No. of cells, 5 ; duration 10 minutes. Result : Much giddiness and flushing ; pulse unchanged ; respirations increased (giddiness was experienced for some hours afterwards).

May 17th : Current sent through the head ; No. of cells, 5-10 ; duration 10 minutes. Result : Some flushing of the face ; sense of constriction and much giddiness ; pulse increased in volume ; no improvement mentally.

May 18th : Current sent through the head ; No. of cells, 5 ; duration 10 minutes. Result : Flushing ; much giddiness ; no mental change.

May 20th : Current sent through the head ; No. of cells, 5 ; duration 10 minutes. Result : Flushing and giddiness induced ; no mental change.

May 21st : Current sent through the head ; No. of cells, 5-10 ; duration 10 minutes. Result : Very sensitive to the current ; slight flushing, with giddiness and a sense of constriction produced ; no change mentally.

May 22nd : Current sent through the head ; No. of cells, 5 ; duration 10

minutes. Result : Much giddiness ; flushing and dimness of vision ; no mental change.

May 23rd : Current sent through the head ; No. of cells, 5-10 ; duration 10 minutes. Result : Giddiness and flushing ; no mental change observed.

May 24th : Current sent through the head ; No. of cells, 5-19 ; duration 10 minutes. Result : Flushing of the face and much giddiness, but these symptoms pass off in the course of a few minutes ; no mental change.

May 25th : Current sent through the head ; No. of cells, 5 ; duration 10 minutes. Result : Flushing and giddiness, but not so much as on former occasions ; no mental change.

May 27th : Current sent through the head ; No. of cells, 5-10 ; duration 10 minutes. Result : Flushing and slight giddiness ; no mental improvement.

May 28th : Current sent through the head ; No. of cells, 5-15 ; duration 10 minutes. Result : No change.

May 29th : Current sent through the head ; No. of cells, 5-15 ; duration 10 minutes. Result : Flushing and giddiness, but less marked than usual ; no mental change.

May 30th : Current sent through the head ; No. of cells, 5-10 ; duration 10 minutes. Result : No change.

May 31st : Current sent through the head ; No. of cells, 5-15 ; duration 10 minutes. Result : Flushing and giddiness ; no mental improvement.

June 1st : Current sent through the head ; No. of cells, 5-10 ; duration 10 minutes. Result : Flushing and slight giddiness ; as yet no improvement in memory observed.

June 3rd : Current sent through the head ; No. of cells, 5-15 ; duration 10 minutes. Result : Flushing and giddiness ; no mental change ; memory for recent events continues almost *nil*.

June 4th : Current sent through the head ; No. of cells, 5-10 ; duration 10 minutes. Result : Flushing and slight giddiness ; no mental change.

June 5th : Current sent through the sympathetics in the neck ; No. of cells, 5-15 ; duration 10 minutes. Result : Flushing and slight giddiness ; no further change.

June 6th : Current sent through the sympathetics in the neck ; No. of cells, 5-20 ; duration 10 minutes. Result : Flushing ; slight giddiness ; pupils unaffected ; no improvement in memory as yet observed.

June 7th : Current sent through the sympathetics in the neck ; No. of cells, 5-15 ; duration 10 minutes. Result : Flushing and slight giddiness ; patient seems to be a little brighter and more intelligent, but memory for recent events continues almost a blank.

June 8th : Current sent through the sympathetics in the neck ; No. of cells, 5-10 ; duration 10 minutes. Result : Flushing and slight giddiness ; patient says she "feels clearer," but change, if any, is very slight.

June 10th : Current sent through the sympathetics in the neck ; No. of cells, 5-10 ; duration 10 minutes. Result : Flushing, but no giddiness ; pupils unaffected : no further change.

June 11th : Current sent through the sympathetics in the neck ; No. of cells, 5-10 ; duration 10 minutes. Result : Much flushing ; no giddiness ; there seems to be a very slight improvement in patient's memory, but it is, as yet, undecided.

June 12th : Current sent through the sympathetics in the neck ; No. of cells, 5-10 ; duration 10 minutes. Result : Flushing ; no further change.

June 13th : Current sent through sympathetics in the neck ; No. of cells, 5-10 ; duration 10 minutes. Result : There is slight improvement in patient's power of retaining an impression, and she is not now so depressed and emotional as before.

June 14th : Current sent through the sympathetics in the neck ; No. of cells, 5-20 ; duration 10 minutes. Result : Patient's memory seems decidedly slightly improved ; yesterday a fact impressed on her mind in the morning was remembered in the afternoon ; the impression does not always remain so long, still always longer than formerly, for, on admission, one or two minutes sufficed to obliterate it ; mental depression is also somewhat less.

E. K., ætat. 20, admitted February 6th, 1872. Case of dementia of uncertain duration. Treatment by electricity commenced May 14th, and continued till June 14th. Current sent through the head and also through the sympathetics in the neck ; No. of cells, 5-30 ; duration of each sitting 10 minutes. Result : Mentally, not the slightest change has at any time been observed ; bodily, effects slight—slight flushing, but no further effect. Patient was, as compared with the others, little sensitive to the current, and never manifested pain or the startings so commonly noticed in the others.

H. C., ætat. 28, admitted April 26th, 1872. Case of dementia following on puerperal mania. Current sent through the head and through the sympathetics in the neck. Treatment commenced May 28th and continued till June 15th. Result : No change observed.

E. A., ætat. 23, single, admitted May 10th, 1867. Case of dementia ; second attack. Treatment commenced June 6th till June 15th ; No. of cells, 5-15. Result : Slight rousing after each application, but the change, on the whole, if any, is very slight. No effect bodily observed.

M. E. F., ætat. 27, admitted March 18th, 1872. Case of melancholia with delusions. Treatment by electricity commenced May 15th ; No. of cells, 5-10. Current sent sometimes through the head, and sometimes through the sympathetics in the neck ; duration, in each case, 10 minutes. Result : The current at first seemed to have a sedative effect, and for a few minutes afterwards she seemed more composed. On one occasion she fainted. The slight beneficial effect, however, was soon no longer noticed, and when treatment was discontinued patient was in no respect better than before. Patient was very sensitive to the current, but, with the exception of occasional flushings, bodily effects were very slight.

A. S., ætat. 24, admitted April 15th, 1872. Case of religious melancholia. Treatment by electricity commenced May 15th and continued till June 14th. Current sent through the head and through sympathetics in the neck ; No. of cells, 5-20. Result : At one time there seemed to be very slight improvement, but, on the whole her mental state continues much the same, as her delusions, regarding the state of her soul, are as yet unshaken.



M. I., ætat. 24, admitted January 28th, 1872. Case of 'melancholic avec stupeur.' Treatment commenced June 10th and is being continued. Current sent through the head. Result: In the first instance decidedly somewhat favourable, stupor being less, there has, however, been, as yet, no advance on this point. Bodily effects, in this case, are very slight.

The results, if we confine ourselves to the cases of acute primary dementia, are thus seen to be satisfactory, if not really striking, and it is in these very cases of *nil admirari* carried to an extreme that the 'moral effect' of the process is least likely to be the actual cause of the change. And we found, as Dr. Major repeatedly proved, that in these cases sensitiveness to the current was often at a very low point.

To sum up, then, it would seem that our results fall into four classes.

1. Those in which marked improvement took place—acute primary dementia.

2. In which distinct improvement was noticed, but to a less degree—mania, atonic melancholia, and perhaps recent secondary dementia.

3. In which no change has been observed—chronic dementia and some cases of melancholia.

4. In which the result has been unfavourable—hypochondriacal melancholia and perhaps brain wasting.

It was found by Dr. Major, and proved by myself on several occasions, that the sensitiveness of these patients to the current varies singularly whether the current be applied to the head or elsewhere.

For instance, as a rule, when there is much dementia, sensibility to the current is lessened. In certain patients, the current is most acutely felt when passing from occiput to forehead, while, in other cases, the effects are more marked when the passage is through the frontal region. In some cases the current is most felt in the head, in other cases the neck seems much more sensitive, but we have not yet reached any definite generalizations concerning these differences. As regards immediate effects, the most common have been flushing and giddiness. The pupils are not easily affected by the continuous current. Increase in the temperature of the body in patients with cold blue extremities, was often noticed, and any tendency to the cataleptic condition



was always removed or lessened in a remarkable manner. These observations, imperfect as they are and must be, will, it is hoped, serve, at least, as an introduction to more extensive investigations, both on our own part and also on the part of our readers, many of whom have ample opportunities for their prosecution.

# OPHTHALMOSCOPIC OBSERVATIONS

IN

## GENERAL PARALYSIS,

AND AFTER THE ADMINISTRATION OF CERTAIN TOXIC AGENTS.

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IN the study of disease any assistance that we can obtain by instruments, in aid of the senses, must prove most acceptable. The application of the stethoscope to the elucidation of the symptomatology and pathology of chest diseases, has placed the diagnosis of morbid conditions of the heart and lungs on a more exact basis than perhaps any other class of diseases. The laryngoscope and the endoscope have augmented, and are daily increasing our knowledge of the state of parts which were formerly supposed to be beyond our view. But next to the stethoscope I think we may rank the ophthalmoscope. By its aid that chaotic mass of diseases, which took refuge under the comprehensive term of amaurosis, has been reduced to something like order. And if we are yet in the dark as to the treatment and probable prognosis of some conditions formerly included in that category, yet, in many other instances, we are able to give an exact account of the morbid state and a sure prognosis. The oculist, however, is not the only person who derives benefit from the employment of this instrument; for the physician has often been able to diagnose obscure cerebral affections through its instrumentality. Although we have heard much of its use in the department of general medicine, as yet it does

not seem to have been much employed in Asylum practice. In this instrument I believe we possess a most valuable agent for investigating the pathology of the multiform and obscure cerebral changes which go hand in hand with mental derangement. I have elsewhere<sup>1</sup> endeavoured to point out the value to be derived from its use in the estimation of the action of various remedial agents upon the cerebral circulation ; and have also shown the condition found in the retinal circulation of the epileptic, and indicated the intimate connection, nay almost identity, of the changes seen in this outlying portion of the nervous system with those observed, after death, by Van der Kolk in the deeper seated portions of the same system.

Perhaps no disease, with which we are brought in contact, has received the attention of so many able and enthusiastic workers as that known as general paralysis of the insane. And yet, in spite of the numerous writers and their discoveries, its pathology remains a mystery. A disease, known to but few, outside our asylum walls, it has devolved upon the alienist physician to record all that is known of its etiology, symptomatology, and pathological anatomy. Being, hitherto, almost always fatal in its termination, and seemingly but little under the control of the physician, it has threatened to become the opprobrium of our specialty. A great hindrance to arriving at correct conclusions has lately arisen from a kind of half knowledge, an imperfect recognition of this disease, which has vitiated our statistics, leading to the belief that it is very greatly on the increase. This increase may be, and, no doubt, to a certain extent, is real, but still one cannot help feeling that many cases are set down as general paralysis which have but little resemblance to it. In many instances, no doubt, the differential diagnosis is most difficult. Any means, therefore, which will aid us in coming to a correct classification must be most welcome. In this paper it will be my object to show that through the instrumentality of the ophthalmoscope we may throw some light upon the natural history and differential diagnosis of this most obscure and intractable disease.

Dr. Allbutt, of Leeds, has published the results of his examinations of the eyes of 51 cases of this disease. Most of

<sup>1</sup> 'West Riding Asylum Medical Reports,' J. & A. Churchill, 1871.

his observations were made upon patients in this asylum, but, as they occurred four years ago, I have not been able to find one patient alive who was then examined. My cases must, therefore, be independent of his, for I shall not be able, as I had hoped, to give any additional report of the patients he then observed. I will now give a short account of Dr. Allbutt's cases, with the conclusions he drew from them, and then proceed to give an analysis of my 43 cases, and show in what points my observations bear out his conclusions.

<sup>1</sup> "Dr. Allbutt examined 53 cases. In 41 of these cases distinct disease of the optic nerve was found, 7 are marked as doubtful, and 5 were normal. He drew the following conclusions from his schedules:—1. That atrophy of the optic discs takes place in nearly every case of general paralysis, and is commonly accompanied by atrophy of the olfactory nerves. 2. That it is not to be distinctly seen until the end of the first stage, as it slowly travels down from the optic centres. 3. That it begins as a pink suffusion of the nerve, without much stasis or exudation, and ends as simple white atrophy. The author likened this process to the so-called 'red-and-white softening in the brain.' 4. That the atrophy of the nerve is not in constant proportion to the ataxy of the muscles of the orbit. 5. That it is in relation to the state of the pupil, which is contracted in the early stages, and dilated in the fully atrophic stage. 6. That as the symptom is not a very early one, it probably has not much diagnostic value; its pathological significance is probably considerable."

After a careful consideration of the cases as given in the tables it will at once appear that only two conditions of the optic nerve were observed, although these differed considerably in different patients, in the two eyes of the same patient, and even in different parts of the disc of the same eye. Some discs are described as being of a pink tint and hazy appearance, others as being of a deep hazy red tint and slightly swollen; whilst a third class are said to be white with a very faint capillary tint; and, lastly, some are described as being quite white and atrophic. It would thus appear that the affection commences

<sup>1</sup> 'Lancet,' March 21st, 1868, p. 378, and 'The Use of the Ophthalmoscope in Diseases of the Nervous System,' Macmillan & Co., 1871.

by inflammation and slight exudation, and ends in atrophy. Now this closely corresponds with the course of the disease, known as descending neuritis, which is thus described by Mr. Soelberg Wells :—"In the descending neuritis the tissue of the nerve is more diffusely clouded (than in the engorged papilla), but the swelling and redness of the disc are much less, and its tint is of a pink grey; the retinal arteries are diminished in calibre, but the veins are less dilated and tortuous than in the engorged papilla." As the disease proceeds, the exudation becomes absorbed, the vascularity diminishes, and the disc slowly grows white.

If we read through the cases in the tables, we shall find that the disease generally ends by one side of the disc, usually the inner, becoming white and atrophic, whilst the inflammatory changes are still in progress at the other. In some cases, however, another course seems to have been taken, for in them we find that the disc has a white rim, and that a very large and shallow excavation, of an extremely pearly white tint, occupies the centre, the remaining portion being said to be of a greyish pink tinge. How the neuritis commences I am unable to say, as all my cases were in the second stage, or stage of mental alienation. Patients are seldom or never brought to an asylum in the first stage, or that of mental alteration, it remains, therefore, for the physician in ordinary practice to give an account of the state of the optic nerves in that stage of the disease. With regard to Dr. Allbutt's fourth position, viz., that the atrophy of the nerve is not in constant proportion to the ataxy of the muscles of the orbit, I must state that in no one case did I find ataxy of the ocular muscles, for whenever the patient's attention could be obtained, the eye was held perfectly steady, and it was only in those cases where excitement or profound fatuity prevailed, and in which attention could not be obtained or sustained, that any apparent ataxy was observed, and this differed greatly from the continuous and restless movements of the eye of a person who is totally blind.

With regard to the pupil, I must first explain that in all these cases I measured its diameter with a pupilometer obtained from Mr. Weiss, which was graduated forty-eight times in the



English inch ; so that the figures 3, 4, 5, &c., stand for  $\frac{3}{48}$ ths,  $\frac{4}{48}$ ths, &c., of an English inch. I thought that by this means I should arrive at a more accurate result than by the use of such expressions as 'dilated,' 'contracted,' &c.

In 23 cases the pupils were unequal, the differences varying from  $\frac{1}{196}$ th to  $\frac{1}{12}$ th of an inch. And the eyes, where this inequality was observed, showed also differences in the condition of the optic discs, the atrophy being most advanced in the eye where the pupil was largest. The pupils were found active to light in 12 cases, sluggish in 19, inactive in 5, and unequally active in 7 cases. The colour of the irides varied greatly, and no conclusions of value could be derived from it. It is recorded as blue in 16 cases, bluish-grey in 3, brown in 10, brownish-grey in 2, grey in 6, and yellowish-brown in 6. The urine was found to be free from albumen and sugar in almost every case.

The ages of these patients were found to range between 32 and 55 years; but as many as 11 were 36, and 35 were between 30 and 40 years of age.

In two cases only was there any sign of syphilis, viz., A. H——, No. 1, in whom choroiditis was seen in both eyes; and H. H——, No. 5, who had adherent pupil from iritis, probably syphilitic. E. S—— and H. H—— are partially aphasic.

Atrophy of the disc was observed in many cases, and was always most complete in the female patients. The atrophic changes were noticed to be most advanced in the left eye, and this again was most distinctly seen in the female patients. Out of 13 females examined, the optic disc is noted to be most atrophic in the left eye of 10, and, in the remaining 3, the changes were equally advanced in both eyes. Let us now consider the value of these observations in their practical bearings.

As I have remarked above, in an asylum we rarely see a patient in the first stage of general paralysis. Those thus afflicted are usually fairly advanced in the second stage, before their acts necessitate their removal from home. Now, at this period of the disease, there is seldom any difficulty in the diagnosis, nevertheless, we do occasionally receive patients suffering from

excitement where the diagnosis is most difficult. And here the ophthalmoscope may help us. The case of S——, No. 25, was one of this class ; when admitted he was in a state of furious mania, after the abatement of which no muscular symptoms were observed, and yet atrophic changes were noticed in his eyes, and his pulse tracing was found to be that so characteristic of general paralysis of the insane. Again, not only the fact that general paralysis is present can be rendered probable by the changes observed with the ophthalmoscope, but an estimate may be formed as to how long the disease has existed ; for we find that the most complete atrophy of the disc was seen in the female cases, from whose history we find the disease to have been of long standing, from two to seven years ; we also find the atrophic changes most advanced in those cases where there seemed to have been an arrest of the symptoms and a state of comparative health attained. This might be important in a medico-legal point of view in cases where the responsibility of a patient, anterior to any mental symptoms being observed, was in question. And lastly we have to consider in what way these changes, revealed by the ophthalmoscope, can guide us in treating the disease. Here I must argue from the analogy of cases of atrophy of the optic nerve with loss of sight, in which vision has been restored. On this subject a most interesting paper, by Mr. Oglesby, of Leeds, will be found in the ‘*Lancet*’ of the 22nd of August, 1868. He there records cases of inflammatory disease of the nervous centres, with atrophic changes of the optic discs, where not only was vision restored, but mental power returned as sight became more perfect. Besides, at the same time that these changes were taking place, the optic discs, which had been perfectly white, slowly resumed their usual capillary tint, although the process extended over a space of six years in one case.

Surely these are hopeful facts, for they teach us that not only may function be restored to parts which we had regarded as useless, but that we may have restoration of atrophied structure.

Now, in general paralysis of the insane, we have a low and diffused form of inflammation, and we find that this action tends to result in a condition resembling that seen in white

atrophy of the optic discs, and that, as the inflammation resolves itself into atrophy, one of two conditions is attained, according to the length of the inflammatory stage, either the patient becomes greatly demented and dies, or a marked improvement, up to a certain point, takes place in his mental and bodily condition. It would thus seem that in certain cases the inflammation has gone on unchecked until it has destroyed so much nerve tissue as to be beyond hope of repair, or that it may happily be arrested for a time, before it has proceeded so far, and then the tendency would seem to be towards a stationary condition.

To show that these conclusions may be fairly drawn from the cases, I must again call attention to the fact that many of the men, in the last and hopeless stage of the disease, had a condition of low neuritis still going on in their optic nerves; whereas, in others of the men and many of the women, we find a condition of advanced atrophy going hand-in-hand with increasing mental power and general usefulness. Possibly, if these patients continue to improve and remain under observation, we may find a restoration of vascularity in their optic discs.

#### OBSERVATIONS AFTER THE ADMINISTRATION OF TOXIC AGENTS.

That the effects of therapeutic agents upon the nervous system can be observed by the ophthalmoscope is, I think, already sufficiently proved, and, therefore, the observations I am about to record need no apology. Last year, in the first volume of these reports, I touched on this ground by detailing the changes seen in the fundus oculi after the administration of certain drugs—Chloral, Ergot, Nitrite of Amyl, and Nitrous Oxide. I now propose to add to this list several other important drugs.

It is now well known that certain toxic agents produce changes in the fundus oculi, which differ, not only in their duration, but also in the mode in which they affect the tissues. Some of these changes are rapid in their appearance and temporary in their duration, any influence they possess passing away in the course of an hour or two, leaving the parts in their

normal condition, and if function have been interfered with, that also is restored. In other instances these effects are slow and gradual in their accession, either marching side by side, preceding, or following, with greater or less speed, certain changes in the cerebral mass and system at large; eventuating in serious interference with, or, it may be, in destruction of function, a destruction so complete that the parts never become restored to their former activity.

As an example of the agents producing such changes, we may first refer to the Ergot of Rye, which, when given in a full dose, causes contraction of the arteries of the retina, and loss of capillary tint of the disc; this condition, however, is only temporary, and in a few hours the vascular apparatus of the eye is seen to have resumed its former state. However long the Ergot may be taken, no permanent effect, of a morbid kind, is produced, either upon the vessels or the nervous tissue. I speak from a considerable experience in the use of the drug. I have had cases under my observation where the liquid ext. has been taken regularly, three times a day, in 3 ij doses, for upwards of six months, and in which I could detect no morbid change in the vessels or nerve tissue, and in which no symptoms of Ergotism were manifested. I have seen aged patients take the drug for several weeks, with benefit to mental symptoms and no inconvenience to the general system.

Very different in its action is the representative drug of the second class. Lead, in whatever way it is introduced into the system, slowly produces changes of a most grave character. The tissue affected is the nervous not the vascular, at least in the stage in which the patients come under observation for saturnine poisoning. I have not, as yet, met with any cases, but the descriptions given of such by Bouchut, Hutchinson, and Allbutt, all indicate that in the early stages of lead poisoning no changes are seen within the eye. Bouchut goes so far as to say that amaurosis may exist from this cause and yet no lesion of the optic nerve be detectable. This so-called amaurosis may possibly, when not complete, be due to paralysis of accommodation on account of affection of the ciliary muscle leading to confusion of vision.

Taking rank between these two extremes, we may place

alcohol, as in its immediate effects it resembles agents belonging to the first class, acting only upon the vascular system, while in its chronic effects, it is like the second class, in that the lesion is found in the nervous tissue and is permanent. Between the two extremes here noted a middle condition exists, exemplified in the disease termed delirium tremens, where the congestion of the fundus is the same as after a single large dose of alcohol, and differs only in its duration. How far these conditions of the fundus oculi are indicative of intra-cranial states is obscure at present. Whether these vascular changes are due to altered conditions of certain vaso-motor centres, governing only the vessels proceeding to the eye; or whether they act upon vaso-motor centres which have a much wider influence, I cannot pretend to determine. Pathological observations, and numerous experiments made by various observers, render it probable that in most instances of intra-ocular vascular changes the same alterations exist at the same time in the brain and its membranes.

Vascular alterations being of a more general nature, more easily observed, and more rapidly produced than nervous changes, we find that toxic agents, producing congestion or anæmia, always act on both eyes in a like manner and to the same extent. On the contrary, when the lesion is in the nervous tissue, producing atrophy of the disc and degeneration of the retina, the state of the two eyes is never the same, one retina being greatly affected while the other may remain in a perfectly normal state, or be but slightly diseased. This fact, in itself, is evidence of the probable identity of intra-ocular and intra-cranial vascularity.

Another argument in favour of the co-existence of intra-cranial with intra-ocular hyperæmia, may be found in the experiments of Manz, who, on injecting fluid into the cranium of a rabbit, found that he had produced dilatation of the retinal veins and stasis. Increase in the quantity of fluid within the cranial cavity, always finds expression in the fundus oculi, whether that increase be within or without the vessels. Illustrations of both these events are not far to seek. Of increase in the quantity of fluid outside the vessels, we have an example in cases of serous effusion, the so-called serous apoplexy betray-



ing itself by retinal venous congestion. In the congestive attacks observed as intercurrent events in cerebral atrophy, and termed by Rokitsansky, attacks of hyperæmia ex vacuo, we have an example of increase in the quantity of fluid within the cranium, and also within the vessels, which at the same time co-exists with venous congestion of the parts within the eye.

The experiments of Donders and Callenfels taken together, with an observation of Bouchut, are valuable as evidence of the identity of intra-cranial and intra-ocular vascular changes. Donders and Callenfels exposed the brain of a rabbit, and then irritated the sympathetic ganglion in the neck; they found, first, contraction of the vessels of the pia-mater with pallor, followed, on the cessation of the irritation, by distension. On cutting the trunk of the sympathetic great dilatation of the vessels of the pia-mater was noted. The retina were not examined in these cases. Bouchut, however, quotes cases in which M. Claude Bernard had divided the great sympathetic in the neck of a rabbit, and in which he had an opportunity of making an ophthalmoscopic examination of the eyes. He states that there was a marked difference in the vascularity of the fundus on the two sides; on the side where the operation had been performed, he found great injection of the disc and increase in the size of the veins.

Mr. Durham exposed the brain of a dog, and observed the effects of chloroform upon the cerebral circulation. M. Bouchut examined the eyes of several patients when under the full influence of the drug, and found great congestion of the retina, these observations agreeing closely with those of Mr. Durham.

Interesting and instructive as these experiments are, when thus placed side by side, yet they do not amount to a distinct proof of the proposition to be established. The only method of setting this question at rest, is, I think, to be found in a repetition of these experiments. To be complete, the brain should be observed by one person at the same time that the eyes are under observation by another. Dogs or cats, as far as my experience goes, are the animals best suited for this purpose, being far superior to rabbits, in that a more vivid and easily obtained picture of the back of the eye can be obtained, and that the vessels of the retina are of much the same size as in the human subject, and that, above all important, in experiments such as

these, the distinction between arteries and veins is well marked and unmistakable.

Having thus endeavoured to show that the changes observed by the ophthalmoscope, in the vessels within the eye are to be regarded as signs of analogous events taking place within the cavity of the skull, and having shown elsewhere that various drugs produce certain well marked changes in the retinal circulation, I think we may fairly assume that in many cases, if not in all, these agents produce like effects in the cerebral vascular system. This being conceded, we have next to inquire in what system, nervous or vascular, do these changes take their origin? If in the nervous system, are we to look to the cerebro-spinal or sympathetic divisions, or to both, as the originator of these vascular alterations? Again, what part of the vascular system is influenced or initiates the action necessary for the production of the phenomena we witness? Is the heart the *point de depart*, or ought we to look to the capillaries?

In order to arrive at an answer to these questions, we must first review a few of the various means by which temporary hyperæmia of the retina may be induced, apart from the agency of toxic substances. In this inquiry we may set aside all local agents, as strong light, injury, &c., considering only those that are general in their operation.

We know that various and opposite conditions of the head and neck are produced by the different emotions of the mind, as illustrated by the blush of shame, and the pallor of fear or speechless rage. We are also aware that these opposite states are identical with the events following section of the great sympathetic in the neck, on the one hand, and irritation of that nerve, on the other. Now, although no observations of the retinal circulation during emotional states have been made, or are perhaps possible, yet as the outward and visible signs of these states are identical with those produced by lesion of the sympathetic, and, as retinal changes have, in that case, been observed to be similar to the external vascular alterations, I think retinal variations may be considered as certainly taking place under the influence of emotion, exclusive of the action of the heart. The same results, however, are observed to follow injury of the medulla oblongata, or section of the anterior roots

of the spinal nerves. We thus have, in the nervous system, three distinct modes of origin of vascular alterations; firstly, emotions; secondly, section of the anterior roots of the spinal nerves, or injury of the medulla oblongata; and lastly, section of the trunk of the sympathetic nerve in the neck, or injury of its ganglia.

The causes of hyperæmia or anæmia of the retina, that are not nervous in their origin, will be found in various diseases of the heart and lungs, such as cause congestion or anæmia in every organ of the body, and often result in death. Several cases of this kind of retinal hyperæmia have been recorded in the first volume of these reports.

Having thus seen that these states of the retinal vascular system may have their origin in various parts of the nervous centres, or in the heart, as the centre of the vascular system, we are now in a position to consider the question, where do these drugs first operate in producing the observed phenomena? Supposing them to act primarily upon the nervous system, is their presence in the blood passing through the emotional centres necessary, or is it only required that their influence be brought to bear upon the medulla oblongata, or, lastly, is it sufficient that blood, charged with these impurities, shall pass through the ganglia of the sympathetic? It is quite possible that one or all of these modes of action is efficient, but that which would seem to be the most probable point of origin is the presence of poisoned blood in the medulla oblongata, for the due performance of whose function pure oxygenated blood is proved to be so necessary. And this theory derives support from the fact that certain inflammatory diseases of the spinal cord exist, which are associated with congestive and atrophic neuro-retinal changes, independently of any travelling of the inflammatory processes along the base of the brain and optic tracts. This influence of the medulla and cord in producing neuro-retinal disease being generally thought to operate through the sympathetic.

If these states seem to be due to modification of the heart's action, in the first instance, and not to any action localised in the capillary system, two explanations of their production are open to us; either the cardiac phenomena are influenced through

a poisoned medulla, or through the poisoned blood in the ganglia of the heart. As both of these theories may be true, it is not necessary to select either, for both, no doubt, are applicable in many cases.

Lastly, the action of one agent, the Ergot of Rye at least, to which reference has been made, would seem to be directly upon the muscular tissue in the walls of the smaller arteries, causing their contraction and thus lessening the flow of blood through them.

The agents that produce anæmia can be divided into two classes, one, acting upon the heart and by producing a condition bordering on syncope, causing retinal as well as general anæmia; the other acting upon the muscular tissue of the arterial walls, and, by reducing the calibre, producing a like state of anæmia.

To the first class, or drugs producing hyperæmia of the retina, belong:—1. Belladonna; 2. Hyoscyamus; 3. Picrotoxine.

To the second class, or drugs producing anæmia, belong:—1. Laburnum; 2. Ergot.

*Belladonna.*—E. F., who had taken the Tincture of Belladonna for some days, was examined twenty hours after taking a dose. The retinal vessels were rather small, and the disc of medium tint. She then took her medicine, which consisted of one drachm of the Tincture of Belladonna. Half an hour afterwards she was again examined, and the following appearances were noted in both eyes:—There is some increase in the capillary tint of the optic disc, and the veins seem to be increased in size. One hour and a half after taking the drug, the disc is greatly deepened in tint, and the retinal arteries and veins are much enlarged, the veins most markedly so.

M. S., had taken Belladonna in the same doses as the last named patient. Her eyes were submitted to examination in the ordinary course of treatment, or, in other words, the first examination was only four hours after last taking the drug. The retinal veins were of fair size, and the tint of the optic disc rather deeper than natural. One hour after taking a drachm of the Tincture of Belladonna, an opthalmoscopic examination was made, when the optic disc was seen to be much darker in colour, and the retinal arteries and veins dilated in a greater degree than at the first examination.

E. C. was ordered half a drachm of the Tincture of Belladonna, three times a day. Her eyes were examined several times before the drug was given, with a view to making their appearance familiar to my eye. I found the vessels in this case to be of good size, the optic discs of a medium pink tint and clear transparent appearance.

One hour after the administration of the first dose, I again examined the



eyes, and thought that I detected some little increase in the size of the arteries, and a deeper tinting of the optic disc ; the retinal veins I did not consider to be increased in size. One hour and a half after the first dose, I again made an observation, and now I became quite certain that a condition of hyperæmia of the retina had become established, the veins, which half-an-hour previously had not seemed to be enlarged, were now, without doubt, dilated.

Six hours afterwards, all these signs had disappeared, and things were *in statu quo ante*.

This patient took the drug for several days and then the dose was doubled. The first day she took the double dose, I examined her eyes, both before and after it was given, and found that a deeper degree of retinal congestion was produced, and that these changes began to show themselves earlier than after the smaller dose.

I examined these patients on many occasions, and always found the same phenomena as those recorded above. Belladonna, when given in full doses, certainly produces retinal hyperæmia.

*Hyoscyamus*.—M. L., was taking two drachm doses of the Tincture of Hyoscyamus for senile mania. The arteries and veins, in the normal state, were small and the disc pale and badly nourished, yet, under the effects of maniacal excitement, an increase could always be detected, both in the vessels and in the tint of the optic disc. The eyes of this patient were particularly well known to me, having, during the last two years been repeatedly under observation. One hour after taking the medicine and when a state of comparative quietness had been induced, I examined the eyes, or rather eye, for one was blocked by a cataractous lens. I found a decided increase in the capillary tint of the disc, an increase in the size of the arteries, but, above all, a widely dilated state of the veins. The next time I examined this patient, the dose had been doubled, and the physiological effects were manifested by a dry tongue and dilated pupils. The state of parts within the eye was the same in kind as on the former occasion, but increased in degree.

E. C., this patient was ordered Tr. Hyoscyamus ʒij, three times a day. The eyes were carefully examined several times previously to taking the first dose. One hour after taking the drug, the retinae were again observed ; the arteries were increased in size, but not so markedly as the veins, and the capillary tint of the optic disc was deepened. When the patient had taken the medicine for a week, the eyes were again examined one hour after taking three drachms, and the congestion was now seen to be more intense than on the former occasion. The retinae, when examined four hours after a dose, were seen to be more vascular than they were before the drug was first ordered, and their increased dilatation more quickly produced.

Many observations were made in this case, and their general results corresponded very closely with the above details.

I now come to treat of a drug which is only known as a poison, and has scarcely yet been placed in the ranks of remedial agents. Picrotoxine, the active principle of *Cocculus Indicus*,



is a crystalline alkaloid possessing most violent and disastrous actions when taken in even a minute dose. It possesses considerable interest on account of the berry, from which it is obtained, being used largely, in this country, for the adulteration of beer and porter, and it has been suggested that this drug may be a very important factor in the production of nervous disease, and more notably epilepsy.

With a view to observing the effects of this alkaloid on the retina, a very fine specimen was obtained from Messrs. T. & H. Smith, of Edinburgh. Little seems to be known as to the action or poisonous dose of this drug, for, on looking through the ordinary text books on 'Materia Medica,' and 'Toxicology,' I was unable to ascertain the quantity requisite to poison a cat or small animal; and its effects upon the nervous system I found to be obscurely stated as delirium, coma, and loss of voluntary power.

In a paper by Dr. Glover, read before the Medical Society of London, on the poisonous action of Picrotoxine, it was stated that this alkaloid did not seem to possess the same powerful effects, in small doses, as some other active principles, such as Atropia and Strychnia; for it had required 10 grains to poison a dog, 10 grains for a rabbit, and 100 grains for a donkey. I afterwards found a description of the symptoms observed in a dog, to which 15 grammes of *Cocculus Indicus* had been given. "When dogs have taken 12 or 16 grammes of finely powdered *Cocculus Indicus*, and have had their gullets tied directly after the injection of the poison, they make repeated attempts to vomit. In from 20 to 25 minutes their gait and attitude became staggering and uncertain, their eyes prominent and haggard, at the same time all their muscles are agitated by a tremor which is at first slight, but which augments by degrees. Soon afterwards their features are altered by convulsive movements, in the various facial muscles, contortions and horrible grimaces announcing a general nervous attack; all at once they take a few steps backwards, stamp their fore paws, then stop, and, when sitting upon their hind quarters, it is only with difficulty they avoid falling down. Their heads now begin to shake violently, in the same manner as a frog's head during an electric shock; sometimes these movements are so vigorous that

the head is thrown back upon the trunk so as to produce a backward tumble, in which the head strikes the ground with force and the body rolls about in every direction. These muscular symptoms cease in from one to ten minutes, the animals get up and try to take some steps forwards, but are soon again attacked; the intensity and frequency of these attacks augment more and more, and soon the most fearful convulsions set in. Lying usually on their side, they agitate their paws with great force and rapidity, the head and tail are both more or less flexed upon the vertebral column, the organs of sense no longer exercise their functions, and one can injure the animals or make noises around them without their displaying the least sign of consciousness; they foam at the mouth; the tongue and gums become more or less livid, the conjunctivæ injected, the respiration hurried and laboured. Sometimes, in this general state of contraction, there is an involuntary emission of urine and fœces. This convulsive condition lasts two or three minutes; the animals appear calm for some instants, but soon fall into a new attack, and they finish by dying after one or two attacks. Ordinarily death takes place in from half-an-hour to an hour after the injection of the poison."

Finding the alkaloid sparingly soluble in water, alcohol, and ether, the first dose of 10 grains was given, suspended in water, to a cat; a solution of Picrotoxine in ether was afterwards made, the strength being 2 grains to the drachm.

With this solution, and one of a reduced strength, I have made all subsequent experiments, injecting the liquid under the skin. The hypodermic method possesses many advantages over the ordinary means of administration. Much pain is saved to the animal, as the gullet does not require to be tied in order to keep the drug in the stomach, and a source of weakness from vomiting is thus avoided; any vomiting that may take place we know must be through the action of the poison on the system, and can not be due to any local action upon the gastric mucous surface. I have found that, contrary to what I had been led to believe, Picrotoxine is very poisonous, in exceedingly small doses, a kitten being almost destroyed by the  $\frac{1}{200}$ th of a grain injected under the skin, and  $\frac{1}{50}$ th of a grain proving fatal to large rats. The ophthalmoscopic appearances were very

uniform in all the cases, and showed a slowly increasing hyperæmia of the retina, the distension of the retinal veins being very great, and the blood they contained seeming very dark in colour.

The act of dying was observed in many instances, and always consisted in a gradual contraction, ending in obliteration of the arteries, the part of the artery nearest the disc being first emptied. The blood in the veins was seen to collect in little clots, giving a beaded appearance to the vessels, and this process commenced immediately after the arteries had completely emptied themselves of blood. The pupils were much contracted in the earlier stages, but only moderately so later on, and, just as death took place, they dilated fully. Squint was not observed in any instance, but, during the convulsions, spasmodic rolling of the eyeballs interfered somewhat with the observation of the fundus. No injection of the conjunctivæ was noted.

The first experiment was made on a large and very powerful male cat, which had some weeks before resisted the effects of a large dose of *Succus Conii* (one and a half fluid ounces). As it had been stated that 10 grains had only been sufficient to kill a rabbit, the same quantity of *Picrotoxine* was suspended in water and introduced into the stomach by means of a tube passed down the *œsophagus*.

Previously to the injection of the poison, the eyes had been long and carefully examined, in order to obtain a good knowledge of the normal appearance of the fundus in each eye.

Five minutes after taking the drug the animal seemed quieter and resisted less, but was uneasy. The pupils were slightly contracted. The *retinæ* were examined, but no change observed. Eight minutes after, the pupils had become smaller and the optic disc was seen to have a deeper tint, and the arteries to be slightly increased in size. At the end of ten minutes, the animal's head was seen to tremble, it placed its fore-feet firmly on the ground, slightly arched its back, and seemed to wish to vomit. These efforts at vomiting quickly called all the muscles of the trunk into action, and ended in a tonic spasm, lasting about ten seconds, in which the head was bent back so as to touch the *scapulæ*, and the tail and hind quarters were also drawn back producing a condition of

opisthotonos. This tonic state was followed by clonic spasms, in which the limbs and facial muscles were agitated with great force and rapidity. After lasting a few seconds the clonic spasms were succeeded by a severe tonic contraction, such as that first described, and lasting for about the same length of time. These states rapidly succeeded one another, until the cat's death, fifteen minutes after the injection of the poison.

During the convulsive period, the eyes were again examined, and the hyperæmic condition of the fundus seen to be much increased. The eyes were under observation as the animal died, and the arteries were seen to contract until they had reached the fineness of a hair, when they emptied themselves from the optic disc towards their distribution. At the same time the disc grew pale and white, and the veins presented a beaded appearance, caused by their contained blood clotting. Rigor mortis followed almost immediately.

Section cadaveris 24 hours after death. Post-mortem rigidity well marked in every part. The brain and spinal cord were removed. The membranes of both were of a pink colour, and all the superficial vessels were gorged with blood. On section of the brain and cord the deep parts were not so congested as the grey matter on the surface. The bones of the head were of a deep blue, almost black hue, from contained blood. The right side of the heart was distended with dark blood and black clots, left side firmly contracted. Lungs not much congested, but most of the other organs were deeply hyperæmic.

A second cat was obtained, of about the same size and age as the last, and to it 5 grains of Picrotoxine, suspended in 2 ounces of water, were introduced into the stomach through a tube. The eyes had been previously examined and their appearance noted. In five minutes she manifested signs of restlessness and anxiety, lay down and moaned; eight minutes after, she placed her fore-paws firmly on the ground, her head trembled, and she made attempts to vomit, but no fluid was ejected; presently the tremor of the muscles extended down the back, and, when it had reached the hind limbs, the head and tail approached each other by an extension of the spine. This tonic spasm ended in clonic convulsions of a most severe description, during which the whole body was agitated, and the limbs moved rapidly backwards



and forwards as in running, the animal being upon its side. During this convulsion, which lasted two or three minutes, the eyes were examined. The pupils had contracted, and the eye-balls moved rapidly from side to side, the retina was congested, the optic discs being of nearly the same tint as the surrounding choroid, and the veins dilated and full of black blood. At the end of fifteen minutes there was a short period of calm, during which the animal lay perfectly still, but the convulsions soon recommenced and continued until death, which took place at the end of twenty minutes from first taking the poison. The eyes were being examined as death took place, and the same order of events was observed as in the first case.

The body was examined twenty-four hours after death, rigor mortis being then well marked. The skull cap was of a deep livid blue colour, and all the sinuses were full of black blood. The superficial veins engorged with blood, and near the longitudinal fissure a small hemorrhage was observed. On cutting into the cerebral substance, the grey matter on the surface was deeply congested, but the central parts did not seem so hyperæmic. The right side of the heart was filled with black blood and dark clots; the lungs were congested in patches near the surface, all the other organs being also markedly congested.

Finding that so small a dose conducted so rapidly to death, I determined to inject a solution beneath the skin. Some large rats were the only animals I could obtain at the time, so, having made a solution of two grains of Picrotoxine in ether, I injected a quantity of this solution, equal to  $\frac{1}{6}$ th of a grain of Picrotoxine, under the skin of the back. The animal made vigorous attempts to escape, but soon seemed to suffer from failure of power in the hind legs; at the end of five minutes there occurred seeming attempts at vomiting, ending in opisthotonos, succeeded by clonic spasms. This condition continued until death, which took place at the end of twenty minutes.

The eyes were so small that no examination of value could be made.

A kitten about four months old, rather thin and very wild, was the next animal experimented upon. One two hundredth of a grain was injected beneath the skin of the back. During



the first five minutes it made frequent attempts to get away, and bit and spat in the most savage manner when approached. It then became quieter, moaned, and seemed feeble; it was now let free, when it immediately staggered to the side of a tame rabbit and lay down by its side. Its eyes were now examined, although with difficulty, as it still made attempts to bite, and resisted as well as it was able. The pupils were found to be slightly contracted, and the tint of the optic disc deeper than before the poison was given. Slight fullness of the retinal veins was also noticed. Fifteen minutes after the injection, muscular tremor set in, commencing in the face and head and slowly extending to the trunk, terminating in a prolonged tonic spasm, in which the head and tail were bent back, and the limbs extended; presently the fore-paws began to move, beating the floor; these movements rapidly increased in speed, the animal turned over on its side, and convulsions of the same nature as had been observed in the other animals became established.

After these had lasted five minutes, there was a short period of quiet, succeeded by the same phenomena as above described. For six hours this condition of alternate periods of repose and tonic, followed by clonic spasms, lasted, the intervals between the fits being longer as time advanced. At the end of this time a permanently tonic condition was established, during which the animal seemed as though under the influence of slight rigor mortis, but the heart could be felt beating, and some respiratory movements were observed. The retinal vessels, at this time, were highly congested, the disc being hardly to be distinguished from the surrounding choroid. During twelve hours, convulsions could be excited by moving the animal about or by rubbing the back. The tonic spasms were very well marked, indeed during the first part of the time so rigid were all the muscles that the body could be held out by taking one paw in the hand. The cat remained in a feeble condition for about a day, and was then running about quite well and far more docile than formerly.

I have not since had the opportunity of administering the drug, but hope to do so in order to see if the effects of a small dose on the retina are of the same kind as when a large dose is used. I have, however, I think, by these experiments, proved

that Picrotoxine is a very powerful poison, when given in very small doses, and that it exerts a very vigorous action upon the cerebro-spinal system, producing symptoms closely allied to epilepsy, and giving similar retinal appearances.

I must now proceed to detail cases where toxic anæmia was observed, and first a case of poisoning by Laburnum Seeds in the human subject, where I was enabled to make several observations of the retina.

E. B., æt. 30, an epileptic, whose eyes I had frequently examined, was taken ill one evening, sickness and vomiting being prominent symptoms. Suspecting poisoning, the ejected matters were examined, and fragments of Laburnum pods and seeds were seen floating in mucous fluid. An emetic of Sulphate of Zinc was given, but as it did not act very rapidly, the stomach was washed out with warm water; however very few fragments of laburnum seeds were removed. On being questioned she confessed that she had eaten two laburnum pods. The surface of the body was cold and bedewed by a clammy perspiration. Pupils widely dilated, pulse small and infrequent. The temperature was taken in the left axilla, and found to be 95·3.

An ophthalmoscopic examination was made. In both eyes the choroid was very pale, being more of a yellow than a pink tint, and quite different from the normal appearance; the optic discs were pale and almost white, from absence of capillary tint. Arteries very small. Veins greatly reduced in size.

During the few hours following this examination, she had several distinct attacks of syncope, in one of which she nearly died. Stimulants and warm applications to the surface of the body restored the animal heat, and in a few days she was perfectly well.

The most interesting points about this case were the decrease of the temperature which so small a dose of laburnum caused, and the contraction of the arterial system, as felt in the pulse and seen in the retina and at the surface of the body. The dilatation of the pupil presented points of interest, as with its dilatation there was dimness of vision, depending either upon paralysis of the muscle of accommodation or cerebral anæmia. The latter is the most probable explanation, as the dilatation co-existed with other cerebral symptoms, such as delirium and confusion of ideas. The frequent attacks of syncope lead to the conclusion that the vascular symptoms were cardaic in their origin.

I shall conclude by giving two cases where the effects of Ergotine were observed, one in an animal and the other in the human subject. In last year's reports I detailed several cases

where the liquid extract of Ergot had been given, and the conditions then observed are identical with those to be described as following the subcutaneous injection of Ergotine.

A large cat had 10 grains of Ergotine injected under the skin of the back. No signs of uneasiness were shown, and the animal remained, to all appearance, unchanged. The eyes had been examined previously to the administration of the drug, and were again examined half-an-hour after. The arteries were seen to be contracted, being about half their normal size; the veins presented little alteration, but the disc was clearer and more distinct than it had previously been. In 24 hours a second observation was made, when the normal condition was found to prevail.

E. B., æt. 25, an epileptic, subject to sudden attacks of mania of a very troublesome description, during which she can, with great difficulty, be kept from injuring her fellow patients; had had, on several occasions, the subcutaneous injection of Ergotine, which on every occasion acted like a charm, producing quietness, which lasted for weeks. Previous to the use of the injection, I, on one occasion, examined her eyes, and found a state of active hyperæmia, the usual condition being one of passive congestion, as seen in dilated veins, and some increase of the capillary tint of the disc. Half-an-hour after the injection of 10 grains of Ergotine beneath the skin of the arm, I observed the retina, and was struck with its altered appearance. The hyperæmia was much reduced, reduction in the size of the arteries, and of the tint of the optic disc being the most marked features.

#### CASES ILLUSTRATING THE OPHTHALMOSCOPIC APPEARANCES PRESENTED BY GENERAL PARALYSIS.

CASE 1.—A. H—, F., æt. 38, admitted July 4th, 1870. *General condition.*—Protracted second stage of disease. *Urine.*—Sp. gr. 1025, acid. *General condition of eye.*—Slightly prominent; irides, blue; pupils, R. 7, L. 11, inactive. *Ophthalmoscopic examination.*—Right eye: O. D. white, indistinct at margins, the retina being very cloudy near it; the yellow spot is of a dark red colour, and surrounded by opaque dirty retina; there are many black spots in the retina, most numerous in the periphery; no white spots; veins small and tortuous; arteries thready. Left eye: O. D. is with difficulty distinguished from surrounding parts, the retina in its neighbourhood having a dirty cloudy appearance; the yellow spot is of a dark colour, and surrounded by pigment; many black patches in retina; veins small and slightly tortuous; arteries fine and sinuous.

CASE 2.—J. E—. F., æt. 36, admitted Oct. 7th, 1870. *General condition.*—Protracted second stage of disease. *Urine.*—Sp. gr. 1012, acid. *General condition of eye.*—Prominent; irides, brown; pupils, R. 5, L. 4½, inactive.

*Ophthalmoscopic examination.*—Right eye : O. D. is white, with a very slight pink tint occupying an inner zone ; the veins are small, and the arteries of medium size. Left eye : O. D. is well defined, is pearly white, but has a margin of a brilliant dead white ; veins are small and thready ; arteries fine and not numerous.

CASE 3.—E. S—, F., æt. 49, admitted Aug. 26th, 1868. *General condition.*—Protracted third stage of disease. *Urine.*—Sp. gr. 1016, acid. *General condition of eye.*—Prominent ; irides, blue ; pupils, R. 7, L. 9, right slightly active. *Ophthalmoscopic examination.*—Right eye : O. D. is of a greyish white colour, with an indistinct white margin ; there is very slight excavation, but it involves nearly the whole disc ; the veins are of small size ; arteries nearly as large as veins, very thready ; besides the main artery there is only one very fine branch to the apparent nasal side. Left eye : O. D. whiter and more indistinct at its margins, where it shades off into the retina ; little or no excavation ; there are more arteries than in the R. O. D. ; they are, however, smaller and very tortuous ; veins slightly tortuous, and of very small calibre.

CASE 4.—S. H—, F., æt. 33, admitted June 3rd, 1870. *General condition.*—Protracted third stage of disease. *Urine.*—Sp. gr. 1025, acid. *General condition of eye.*—Prominence, normal ; irides, brown ; pupils, R. 5, L. 6, inactive. *Ophthalmoscopic examination.*—Right eye : O. D. somewhat congested, margins of disc well defined, slight central excavation, the whole surrounded by a dark halo ; veins have a somewhat tortuous course, and are of a large size ; the arteries numerous and of fair calibre ; choroid dark. Left eye : O. D. elliptical, of a decided red colour, and having only a very faint white centre ; the choroid round is fairly pigmented ; veins tortuous and full of blood ; arteries numerous and of fair size.

CASE 5.—A. H—, F., æt. 49, admitted Feb. 28th, 1871. *General condition.*—Protracted second stage of disease. *Urine.*—Sp. gr. 1020, acid. *General condition of eye.*—Prominence, normal ; irides, brownish grey ; pupils, R. 5, L. 4, R. inactive, L. sluggish. *Ophthalmoscopic examination.*—Left eye : O. D. has a clean punched out appearance, and is white at the margins, but of a general greyish pink tinge ; there are no small arteries proceeding from it, except the proper retinal arteries and veins, which are both of small calibre, the arteries being mere threads.

CASE 6.—S. W—, F., æt. 36, admitted Sept. 2nd, 1870. *General condition.*—Protracted second stage of disease. *Urine.*—Sp. gr. 1020, acid. *General condition of eye.*—Prominence, normal ; irides, bluish grey ; pupils, R. 8, L. 11, R. sluggish, L. inactive. *Ophthalmoscopic examination.*—Right eye : Edges of O. D. indistinct, and of a slightly darker colour than the greater part of the disc, which is of a greyish pink colour ; veins are small and thready ; arteries small and twisted, but not so small in proportion as the veins. Left eye : O. D. indistinct at margin, but whiter round the edge than the R. ; most indistinct and of deepest colour near inner side ; no central white excavation ; veins very thready and tortuous ; arteries numerous but very small.

CASE 7.—M. S—, F., æt. 35, admitted Nov. 1st, 1870. *General condition.*—Protracted second stage of disease. *Urine.*—Sp. gr. 1025, acid. *General*



*condition of eye.*—Prominence, slightly sunken and small; irides, blue grey; pupils, R. 6, L. 4, both act slightly. *Ophthalmoscopic examination.*—Right eye: O. D. white and ill-defined, the retina near it being slightly cloudy; the surrounding choroid near the O. D. is much paler than at a distance from it; the veins are rather smaller than normal and slightly tortuous; arteries very fine and tortuous. Left eye: O. D. indistinct at the edges, and whiter than the R.; the veins are of the same character but slightly larger; arteries slightly larger, tortuous, and all branches of the central artery; there are no small vessels springing from the disc.

CASE 8.—M. A. S—, F., æt. 38, admitted Sept. 21st, 1870. *General condition.*—Protracted second stage of disease. *Urine.*—Sp. gr. 1020, acid, no albumen, no sugar. *General condition of eye.*—Slightly prominent; irides, grey; pupils, equal 4, inactive or nearly so. *Ophthalmoscopic examination.*—Right eye: O. D. indistinct to outer side, the outer half being of a darkish pink colour, the inner of a brilliant white; veins small and tortuous; arteries of medium size. Left eye: O. D. clearly punched out margin, very white to inner side; there is a slight pink zone near the centre; veins small and thready; arteries fine and tortuous.

CASE 9.—M. A. S—, F., æt. 39, admitted Nov. 9th, 1869. *General condition.* Protracted third stage of disease. *Urine.*—Sp. gr. 1014, acid. *General condition of eye.*—Rather prominent; irides, dark blue; pupils, R. 3, L. 4, sluggish. *Ophthalmoscopic examination.*—Right eye: O. D. is oval, very pale colour, and having a large and very white central spot; the veins are of medium size, and the arteries small. Left eye: O. D. is paler than the right, and has a larger central white spot; the veins are small; the arteries smaller than in the right eye; choroid of a medium tint. The excavation is seen to be deepest in the right eye.

CASE 10.—M. H—, F., æt. 40, admitted, Sept. 7th, 1870. *General condition.*—Protracted second stage of disease. *Urine.*—Sp. gr. 1018, acid. *General condition of eye.*—Prominence, normal; irides, grey; pupils, R. 3, L. 4, inactive. *Ophthalmoscopic examination.*—Right eye: O. D. fairly defined and of a pink colour, the inner half having a white margin; there is a congenital white patch of a fan-like shape situated below the disc; it is narrowest near the disc, from the edge of which it seems to spring and radiate outwards; it is about as broad as one and a half times the diameter of the disc, and as long as one half the disc; veins of medium size, some are traced over and others through the patch; arteries small. Left eye: O. D. well defined by a white rim, which almost encircles it; it is of a medium pink tint, and darkest to the inner side; veins are small and tortuous; arteries fine and also tortuous.

CASE 11.—W. T—, M., æt. 42, admitted Feb. 10th, 1871. *General condition.*—Protracted third stage of disease. *General condition of eye.*—Prominence, sunken; irides, light brown; pupils, R. 2, L. 2, inactive. *Ophthalmoscopic examination.*—Right eye: O. D. well defined by a white rim to the inner side, of a transparent pink tint, slightly hazy to inner side; veins are of medium size; arteries also of medium size, most numerous to inner side. Left eye: O. D. well defined, of a transparent greyish pink tint; veins are of medium size; arteries rather small.



CASE 12.—H. T—, M., æt. 36, admitted March 16th, 1870. *General condition*.—Protracted third stage of disease. *Urine*.—Sp. gr. 1625, acid. *General condition of eye*.—Prominence, normal; irides, dark blue; pupils, R. 6, active, L. 8, sluggish. *Ophthalmoscopic examination*.—Right eye: O. D. very hazy and indistinct at the margins, of a pink tint, and cloudy appearance; veins rather large; arteries small and numerous. Left eye: O. D. indistinct at the margins and generally cloudy, of a pink colour; veins are rather large and somewhat tortuous; arteries of fair size, many of small calibre proceed from the edge of the disc.

CASE 13.—M. H—, F., æt. 46, admitted April 14th, 1871. *General condition*.—Protracted third stage of disease. *Urine*.—Sp. gr. 1020, acid. *General condition of eye*.—Prominence, normal; irides, blue; pupils, R. 3, L. 4, sluggish. *Ophthalmoscopic examination*.—Right eye: O. D. is decidedly white, although it still has a slight capillary tint near the centre; there is slight shallow cupping; veins are of medium size and somewhat tortuous; arteries are rather small. Left eye: O. D. is round, of a decided white tint, most so round the edges, but there is still a slight capillary tint near the centre of the disc; veins are small and tortuous; arteries very small and not numerous.

CASE 14.—A. B—, F., æt. 46, admitted April 10th, 1871. *General condition*.—Protracted third stage of disease. *Urine*.—Sp. gr. 1010, acid. *General condition of eye*.—Prominence, normal; irides, brown; pupils, R. 2, L. 2½, sluggish. *Ophthalmoscopic examination*.—Right eye: O. D. is slightly oval, very red, hazy, and indistinct, being slightly swollen; veins are of medium size and slightly tortuous; arteries are of medium size, and there are numerous small branches proceeding from the edge of the disc. Left eye: O. D. is defined towards the upper and outer border, where it is whitest, the rest of the disc being of a deep pink tint, and hazy and indistinct at the lower border; veins are small and tortuous; arteries small and thready, and not so numerous as in the right.

CASE 15.—A. E. R—, F., æt. 32, admitted Oct. 11th, 1869. *General condition*.—Protracted second stage of disease. *Urine*.—Sp. gr. 1012, acid. *General condition of eye*.—Prominence, normal; irides, blue; pupils, R. 4, L. 5, sluggish. *Ophthalmoscopic examination*.—Right eye: O. D. well defined, of a general white tint, whitest in centre and towards inner side; veins are of small size; arteries medium sized and not numerous. Left eye: O. D. is whiter than the right, there being a large central shallow excavation, and a zone round this of a very pale pink; veins are small, slightly tortuous; arteries small and thready.

CASE 16.—A. D—, F., æt. 33, admitted Jan. 16th, 1871. *General condition*.—Early in second stage of disease. *Urine*.—Sp. gr. 1030, acid. *General condition of eye*.—Prominence, normal; irides, blue; pupils, R. 3, L. 3½, active. *Ophthalmoscopic examination*.—Right eye: O. D. well defined by a slight white rim, its centre being of a pink colour, and the remainder of a greyish pink; veins are of medium size, and where they pass over the disc are slightly tortuous; arteries rather numerous, but of small size. Left eye: O. D. of irregular shape and surrounded by black pigment, of a greyish pink colour, whitest to the inner side, the outer being slightly swollen and hazy; veins of medium size; arteries fairly numerous, but not of large size.

CASE 17.—J. N—, M., æt. 35, admitted April 12th, 1870. *General condition.*—Second stage of disease. *Urine.*—Sp. gr. 1016, acid. *General condition of eye.*—Prominence, normal ; irides, dark blue ; pupils, R. 6, inactive, L. 4, active. *Ophthalmoscopic examination.*—Right eye : O. D. irregular in outline, the edges being white, the inner edge of a blue white, the remaining portion of a very pale pink ; veins medium size and tortuous ; arteries small but numerous ; there are several portions of transparent retina, with slight atrophy of the choroid, near the disc. Left eye : O. D. slightly irregular in shape to the outer side, well defined to the inner side ; there is an outer zone of white, most marked on the inner side, the remaining portion of the disc is of a greyish pink tint, and slightly hazy ; veins small and tortuous ; retina very thin, so as to make the choroidal vessels more visible than usual.

CASE 18.—W. H—, M., æt. 38, admitted February 10th, 1871. *General condition.*—Third stage of disease. *Urine.*—Sp. gr. 1012, acid. *General condition of eye.*—Prominence, normal ; irides, grey ; pupils, R. 3, L. 2, sluggish. *Ophthalmoscopic examination.*—Right eye : O. D. defined, and of a greyish pink colour, having a large central white spot ; veins of medium size ; arteries small, not numerous ; retina round disc slightly swollen and hazy. Left eye : O. D. inner side well defined, of a pale colour, outer side red, indistinct, and hazy there is a large central white spot ; veins medium size ; arteries very small, and not numerous. The excavation in these eyes is shallow, and of a very white tint.

CASE 19.—S. W—, M., æt. 38, admitted June 30th, 1869. *General condition.*—Third stage of disease. *Urine.*—Sp. gr. 1018, acid. *General condition of eye.*—Slightly prominent ; irides, light brown ; pupils, R. 3, L. 3, sluggish. *Ophthalmoscopic examination.*—Right eye : O. D. is pink, hazy, and indistinct ; veins small ; arteries minute. Left eye : O. D. defined, of a pink tinge, and very hazy ; veins very small ; arteries small, and not numerous.

CASE 20.—J. H—, M., æt. 55, admitted February 8th, 1870. *General condition.*—Third stage of disease. *Urine.*—Sp. gr. 1020, acid. *General condition of eye.*—Slightly sunken ; irides, grey ; pupils, R. 2, L. 2, inactive. *Ophthalmoscopic examination.*—O. D. well defined, slightly red to outer side the remainder being of a greyish white ; veins small and tortuous ; arteries minute. Left eye : O. D. well defined, being very white to the inner side ; veins small ; arteries minute.

CASE 21.—A. R—, M., æt. 30, admitted November 3rd, 1870. *General condition.*—Second stage of disease. *Urine.*—Sp. gr. 1016, acid. *General condition of eye.*—Slightly prominent ; irides, light brown ; pupils, R. 8, sluggish, L. 7, active. *Ophthalmoscopic examination.*—Right eye : O. D. whitish at the edges, red in its central parts, the whole very hazy ; veins rather large and tortuous ; arteries very numerous. Left eye : O. D. has a white rim, and a minute white centre, the rest of the disc is of a dark pink tint, and very hazy ; the veins rather tortuous and large ; arteries numerous.

CASE 22.—G. P—, M., æt. 36, admitted October 6th, 1870. *General condition.*—Third stage of disease. *Urine.*—Sp. gr. 1018, acid. *General condition of eye.*—Prominence, normal ; irides, dark blue ; pupils, R. 8, sluggish,

L. 6, active. *Ophthalmoscopic examination*.—Right eye : O. D. slightly irregular, of a pale pink colour, and rather hazy ; veins of medium size ; arteries small. Left eye : O. D. pink colour to the outer side, where it is indistinct and hazy, the inner part of a pale colour, its edge being white ; veins rather large and tortuous ; arteries small but very numerous.

CASE 23.—D. T—, M., æt. 36. *General condition*.—Third stage of disease. *Urine*.—Sp. gr. 1019, acid. *General condition of eye*.—Prominence, normal ; irides, dark blue ; pupils, equal 5, sluggish. *Ophthalmoscopic examination*.—Right eye : O. D. is very red and hazy, fairly well defined, except to the inner side, where it is slightly ragged at the edge ; veins are numerous and of uneven calibre, also slightly tortuous ; arteries are of medium size and tortuous, a great number of small ones proceeding from the edge of the disc. Left eye : O. D. is paler, but is more hazy and indistinct than the right ; veins are large and of uneven calibre, they seem to dip down into the swollen disc and then reappear ; arteries are numerous and tortuous, a number of small ones proceeding from the edge.

CASE 24.—W. S—, M., æt. 36, admitted March 4th, 1871. *General condition*.—Third stage of disease. *Urine*.—Sp. gr. 1018, acid. *General condition of eye*.—Prominence, normal ; irides, dark brown ; pupils, R. 5, L. 4, sluggish. *Ophthalmoscopic examination*.—Right eye : O. D. has a deep red tint and hazy appearance ; veins are of medium size, and present an angular appearance ; arteries are small and tortuous. Left eye : O. D. is of a greyish pink tint and hazy appearance ; veins are of medium size and angular ; arteries are small and tortuous, a number of small branches proceeding from the edge in all directions. Retinæ are more hazy than usual in both eyes.

CASE 25.—J. W. S—, M., æt. 24, admitted March 1st, 1871. *General condition*.—Second stage of disease. *Urine*.—Sp. gr. 1014, acid. *General condition of eye*.—Prominence, normal ; irides, dark blue ; pupils, R. 6, L. 6½, sluggish. *Ophthalmoscopic examination*.—Right eye : O. D. has a pearly white centre, the remainder up to the edge being of a greyish pink tint, to outer and inferior border it is slightly hazy ; veins are of small size and angular appearance, they do not approach each other on the disc, but dip down ; arteries very few and minute. Left eye : O. D. is whiter than the right and more uniformly tinted, to the outer and inferior border it is hazy and indistinct ; veins are very tortuous in their whole course ; arteries minute and thready, also slightly tortuous.

CASE 26.—J. M—, M., æt. 47, admitted March 1st, 1869. *General condition*.—Third stage of disease. *Urine*.—Sp. gr. 1018, acid. *General condition of eye*.—Slightly prominent ; irides, blue grey ; pupils, R. 4, inactive, L. 2, active. *Ophthalmoscopic examination*.—Right eye : O. D. is of an irregular oval shape, there is a central white portion, next a zone of a pale pink, beyond this the disc is of a greyish white ; veins large and tortuous ; arteries very small ; the excavation in this disc is very deep. Left eye : O. D. defined by an irregular white rim, there is a slight central white spot, the rest of the disc being a medium pink tinge ; the veins are small and somewhat angular ; arteries larger than in right.

CASE 27.—H. S—, M., æt. 39, admitted March 20th, 1871. *General condition.*—Second stage of disease. *Urine.*—Sp. gr. 1020, acid. *General condition of eye.*—Slightly prominent; irides, light brown; pupils, 9 each, sluggish. *Ophthalmoscopic examination.*—Right eye: O. D. margin is defined, and of a uniform pink tinge, there is a slight white spot in the centre; veins are slightly tortuous, but of medium size; arteries very numerous, but rather small. Left eye: O. D. is slightly oval in shape, of a pale pink tinge, and having a large central white spot; veins medium sized; arteries rather small.

CASE 28.—J. H—, M., æt. 39, admitted March 5th, 1869. *General condition.*—Protracted second stage of disease. *Urine.*—Sp. gr. 1018, acid, no albumen, no sugar. *General condition of eye.*—Prominence, normal; irides, brownish grey; pupils, R. 3, L. 4, active. *Ophthalmoscopic examination.*—Right eye: O. D. indistinct at the margins, and of a deep pink tinge; veins are small; arteries very fine. Left eye: O. D. irregular in shape, having a white outer border and a central white spot; the veins are rather large and somewhat tortuous; arteries very fine.

CASE 29.—M. F—, M., æt. 38, admitted May 27th, 1870. *General condition.*—Third stage of disease. *Urine.*—Sp. gr. 1025, acid. *General condition of eye.*—Slightly prominent; irides, grey; pupils, R. 4, L. 4, active. *Ophthalmoscopic examination.*—Right eye: O. D. well defined by a narrow white rim of medium red tint, and having central bright white spot; veins small; arteries of nearly equal size; choroid of a deep tint; retina fairly clear. Left eye: O. D. well defined, very narrow white rim, it also has a small central white spot, the rest being of a medium pink glow; veins small; arteries numerous and thready; choroid and retina the same as in the right eye.

CASE 30.—G. F—, M., æt. 46, admitted March 31st, 1868. *General condition.*—Third stage of disease. *Urine.*—1010, acid, small quantity of albumen, no sugar. *General condition of eye.*—Slightly prominent; irides, grey; pupils, R. 3½, L. 4, both active. *Ophthalmoscopic examination.*—Right eye: O. D. well defined, dark pink, nearly the same colour as the choroid; veins very small, especially where they pass over the disc; arteries small, tortuous, and somewhat indistinct; choroid of a medium red glow; retina slightly hazy. Left eye: O. D. darker red than the right, indistinct at the margin; veins larger than in the right; arteries small and indistinct; choroid a medium tint; retina hazy.

CASE 31.—J. B—, M., æt. 54, admitted August 30th, 1870. *General condition.*—Third stage of disease. *Urine.*—Sp. gr. 1012, acid. *General condition of eye.*—Prominence, normal; irides, dark brown; pupils, R. 4, L. 4, both active. *Ophthalmoscopic examination.*—Right eye: O. D. unevenly shaped, presenting a slightly ragged edge, which is almost white, the disc is of a pale pink colour; veins are of a medium size; arteries small; choroid dark; retina slightly hazy. Left eye: O. D. defined by a narrow white rim, has a slight central white spot, the rest of the disc being of a medium pink colour; veins medium sized; arteries rather small and twisty.

CASE 32.—H. B—, M., æt. 36, admitted April 29th, 1869. *General condition.*—Third stage of disease. *Urine.*—Sp. gr. 1018, alkaline, no albumen, no



sugar. *General condition of eye.*—Prominence, medium ; irides, dark brown ; pupils, R. 4, L. 4, sluggish. *Ophthalmoscopic examination.*—Right eye : O. D. slightly oval in shape, having a large central white portion, the remainder being of a very pale pink ; the veins rather large ; arteries rather small ; choroid of a bright red glow. Left eye : O. D. well defined, of a pale colour, and having a very large white central spot ; veins large ; arteries small ; choroid rather dark.

CASE 33.—G. A—, M., æt. 39, admitted April 2nd, 1870. *General condition.*—Second stage of disease. *Urine.*—Sp. gr. 1015, acid, slight traces of albumen, no sugar. *General condition of eye.*—Prominence, normal ; irides, violet blue ; pupils, R. 6, L. 6, sluggish. *Ophthalmoscopic examination.*—Right eye : O. D. indistinct at the margins, of a pink colour, and hazy ; veins large and tortuous ; arteries minute and numerous. Left eye : O. D. irregular in shape, rather white at the margins, the remaining portion is not of so dark a tint as in the right ; veins of medium size and tortuous ; arteries minute, not so numerous as in the right ; the retina and choroid near the disc are slightly atrophied.

CASE 34.—J. W—, M., æt. 36, admitted April 12th, 1870. *General condition.*—Second stage of disease. *Urine.*—Sp. gr. 1020, acid. *General condition of eye.*—Prominent ; irides, violet blue ; pupils, R. 4, L. 3, sluggish. *Ophthalmoscopic examination.*—Right eye : O. D. of an irregular oval shape, of a whitish tint, and having a large central white spot ; veins small ; arteries very fine ; retina slightly hazy. Left eye : O. D. well defined by a white rim, there is next a narrow zone of a greyish pink tinge, and then a large central white spot ; veins small ; arteries very thready.

CASE 35.—H. B. R—, M., æt. 47, admitted April 2nd, 1869. *General condition.*—Protracted second stage of disease. *Urine.*—Sp. gr. 1018, acid. *General condition of eye.*—Prominence, normal ; irides, dark blue ; pupils, R. 4, L. 4½, active. *Ophthalmoscopic examination.*—Right eye : O. D. is well defined to inner side, indistinct to outer, where it is of a pale pink colour, the inner half is of a greyish white ; veins of medium size, but thinnest where they pass over the disc, and rather tortuous ; arteries small ; choroidal glow light. Left eye : O. D. margins indistinct and white, the rest of the disc of a pale pink ; veins medium sized ; arteries very fine.

CASE 36.—J. M—, M., æt. 36. *General condition.*—Second stage of disease. *Urine.*—Sp. gr. 1015, acid. *General condition of eye.*—Prominence, normal ; irides, yellowish brown ; pupils, L. 4, R. 4½, active. *Ophthalmoscopic examination.*—Right eye : O. D. has a slight capillary tint at all parts of its surface, except the centre, which is white ; veins are of medium size, and not tortuous ; arteries are rather small. Left eye : O. D. is of a rather deeper tint, but slightly hazy, there is, however, a slight white cloudy rim to the upper and inner part of the disc ; veins are of medium size ; arteries much twisted on the disc, small, and tortuous.

CASE 37.—J. P—, M., æt. 42, admitted December 28th, 1870. *General condition.*—Third stage of disease. *Urine.*—Sp. gr. 1012, acid. *General condition of eye.*—Prominence, normal ; irides, yellowish brown ; pupils, L. 3



R. 3, inactive. *Ophthalmoscopic examination*.—Right eye: O. D. is of a deep red tint and very hazy appearance, most so at the edges; veins of medium size, except the one which ascends, and that seems to become narrower as it passes over the disc; arteries are small and tortuous, there being a large number of small ones passing from the edge of the disc in all directions. Left eye: O. D. is not of so deep a tint, but is more hazy and swollen than the right; veins are large and seem to project where they pass over the edge of the disc; arteries are numerous and tortuous, a great number seeming to spring from the edge of the disc, and some of those passing from the centre seem to be lost for a part of their course in the swollen disc.

CASE 38.—H. H—, M., æt. 43, admitted December 28th, 1869. *General condition*.—Second stage of disease. *Urine*.—Sp. gr. 1007, acid. *General condition of eye*.—Prominence, normal; irides, yellowish brown; pupils, L. 4, R. 4, active. *Ophthalmoscopic examination*.—Right eye: O. D. is of a hazy pink tint, there is, however, a considerable part of its inner surface which is quite white and has an uneven edge; veins are of medium size and uneven calibre, being dilated at some points and narrowed at others; arteries are not very numerous, but most so near the outer edge of the disc. Left eye: O. D. the inner half is white and almost of a blue white at the edge, the outer half is swollen, hazy, and red; veins are of good size and slightly tortuous; arteries are of small size and few towards the inner side, numerous and of small size from the outer swollen edge of the disc.

CASE 39.—E. D—, M., æt. 36, admitted January 11th, 1870. *General condition*.—Second stage of disease. *Urine*.—Sp. gr. 1016, acid. *General condition of eye*.—Slightly prominent; irides, dark blue; pupils, L. 5, R. 5, active. *Ophthalmoscopic examination*.—Right eye: O. D. slightly irregular margin, is of a pale greyish pink tint; veins are large until they reach the edge of the disc, when their calibre seems reduced as they pass over the surface; arteries are not very numerous, but are very tortuous and wavy. Left eye: O. D. is defined on its inner side by a pearly white rim, the rest of its surface is of a greyish pink tinge, slightly hazy to the outer side; the veins are of good size and numerous; arteries are small and tortuous.

CASE 40.—C. E. T—, M., æt. 36, admitted May 23rd, 1870. *General condition*.—Second stage of disease. *Urine*.—Sp. gr. 1014, acid. *General condition of eye*.—Prominence, normal; irides, yellowish brown; pupils, L. 5, R. 6, active. *Ophthalmoscopic examination*.—Right eye: O. D. defined by a rim of pearly white, the remainder of its surface being of a greyish pink tinge and slightly hazy; veins are small and not numerous; arteries are very small and wavy; no small branches proceed from the edge of the disc. Left eye: O. D. of a deep red tint and hazy appearance; the veins are of small size, slightly tortuous, and of uneven calibre in parts of their course; arteries are more numerous than in the right, and tortuous.

CASE 41.—J. C—, M., æt. 43, admitted December 3rd, 1868. *General condition*.—Second stage of disease. *Urine*.—Sp. gr. 1020, acid. *General condition of eye*.—Prominence, normal; irides, yellowish brown; pupils, L. 5, R. 5, active. *Ophthalmoscopic examination*.—Right eye: O. D. very white, being pearly at the inner edge, but having the slightest capillary tint to the

outer side ; veins are small and few, being somewhat twisted ; arteries are also small and tortuous. Left eye : O. D. is generally very white, but is most so to its inner side, where its edge is uneven and woolly, but of a pearly tint ; veins are small and angular ; arteries minute and twisted.

CASE 42.—T. B—, M., æt. 49, admitted March 6th, 1871. *General condition.*—Second stage of disease. *Urine.*—Sp. gr. 1020, acid. *General condition of eye.*—Prominence, normal ; irides, yellowish brown ; pupils, L. 4, R. 4½, sluggish. *Ophthalmoscopic examination.*—Right eye : O. D. is white, with a slight capillary tint to its outer side, its edges are uneven and somewhat indistinct ; veins are of medium size and rather angular, where they pass over the surface of the disc they are much attenuated ; arteries are very small and tortuous ; retinæ in both are atrophied near the disc. Left eye : O. D. is generally white, but has a small portion of its outer surface swollen ; veins are of medium size and smallest where they pass over the surface of the disc ; arteries are small and tortuous, there being a number of small ones proceeding from the outer hazy portion.

CASE 43.—C. J—, M., æt. 42, admitted June 1st, 1870. *General condition.*—Second stage of disease. *Urine.*—Sp. gr. 1020, acid. *General condition of eye.*—Prominence, normal ; irides, dark blue ; pupils, L. 6, R. 6, sluggish. *Ophthalmoscopic examination.*—Right eye : O. D. has a grey pink centre, and the remainder is of a pearly white, irregular and woolly at the edges ; veins are few and angular ; arteries small and twisted, but not numerous ; choroid atrophied near the disc ; no reflex, or only very slight, from retina near disc. Left eye : O. D. of a faint greyish pink tint, it is, however, surrounded by a broad band of a pearly white, which has a few spots of pigment on it (atrophied choroid) ; veins are very few, small, and angular ; arteries minute and very few.

# THE USE OF OPIUM

IN THE

## TREATMENT OF MELANCHOLIA.

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THE use of Opium in the treatment of insanity, seems to have been a point on which the opinions of medical psychologists have differed from the earliest times, to have formed an arena on which more battles have been fought, a rock on which more theories have been shattered, than any other subject in the history of lunacy. From the earliest down to recent times it seems to have had its supporters. Cullen, Ferriar, Hallaran, Johnston, Esquirol, Valsalva, Morgagni, Phillips, Pliny Earle all made use of it, and all speak of its good effects. Medical psychologists seem to have thought that in it, they had found the universal panacea for "the mind diseased," the lethe for all ills of the brain, till its use, carried to extremes, brought the certain result—in place of clearing the obscured mind, it caused a complete chaos—instead of bringing health, it induced sudden death. Then of course came a revulsion of feeling, numerous articles appeared on the evil effects of Opium, till at the present day it is the fashion to decry its use.

But if we look into the writing of those who are quoted as its opponents, we will find that it was not its use (which they oftentimes highly extol) but its abuse that they censured.<sup>1</sup> Dr. Conolly whilst he speaks of "the excessive and prolonged

<sup>1</sup> Conolly's Lectures on Insanity.

use of sedatives as the producer of a mere alteration in the form of the disease," goes on to say "sedatives are occasionally useful in the suicidal paroxysms, inducing forgetfulness and sleep," and Dr. Noble, in his article on the dangerous and suddenly bad effects of Opium, says, "of course it will be observed from my earlier remarks, that I am not now referring to the mild soothing influence of small doses of Opium, but to the severe, the sleep compelling action of the remedy," and, in our text book of the present day, Tuke speaks of it as the sheet anchor of the alienist physician.

The treatment of melancholia by Opium, from its first introduction by Odier, of Geneva, seems to have met with well deserved approbation, and to have been recognised as the most hopeful and best by most of those who have had the largest experience in the treatment of that disease. Conolly, Seymour, Tuke all extol its use, but even in this relation it has met with numerous opponents. Dr. Tigges, of the Asylum of Marsberg, gives a report of 49 cases of melancholia treated with Opium, and comes to the conclusion that only 4 were benefited, whilst 8 were injured by the treatment. But in his determination to avoid "the disturbance of the inferences to be drawn from his calculations," Dr. Tigges seems to have done all in his power to prevent any good effects from the Opium treatment. He took as subjects on whom to experiment, patients who had been suffering from the disease for at least 2 months, and we may suppose that in nearly all it had existed much longer, forgetting Guislain's dictum, that after three months no treatment is of any avail in this disease. He also gave it in such large doses that digestion was interfered with, but admits after all that in 14 cases treatment had been useful, though he will not allow these good effects to have been due to the Opium.

In this country, Dr. Maudsley opposes the use of Opium, as of all other medicine in insanity, and brings forward Dr. Clouston's experiments to prove its pernicious effects, in all cases when taken for any length of time. Dr. Clouston is quoted as proving the following conclusions.—1. The Opium soon lost its effect.—2. All the patients lost weight.—3. Their average temperature fell.—4. The pulse was lowered, and lastly, it interfered with the proper nutrition of the body, and

pushed it one step further down the hill in the direction of death. That this may be true of Opium when given in such heroic doses and used in mania as most of our ancestors and nearly all those who oppose its use in the present day have done, I have no means of disproving. But first let me call attention to the adverse circumstances in which the drug has been placed in many of the experiments made with Opium. Dr. Tigges first waits for two months before he begins treatment, and then refuses to see any good results from it. Dr. Clouston's experiments were carried out with much care and originality, but his field of labour was small, and his experiments (in Opium at least) were made in such hopeless patients that one could hardly condemn a drug from his results. According to Dr. Clouston the action of Opium, in all mental diseases, is to "interfere with the proper nutrition of the body and push it one step further down the hill in the direction of death." That such should be its effect in his own experiments, he himself tells us he took good care to make inevitable, by taking chronic maniacs, "who were incurable and to whom the experiment could do no harm," so that Dr. Clouston, according to his own statement, might as well have experimented on so many wax figures, as far as any effect could be produced by the drug for either good or evil; very good results could not be looked for in incurable cases.

But first of all, I would call attention to the fact that many writers on this drug seem to have looked on it as having only one action—one property—that of a narcotic and sedative, and to have supposed that it could have no proper action, no influence for good till this was obtained; hence seems to have originated the desire always to rush at once to large doses, and even when good effects were obtained from the smaller, to ignore them and cry for stronger doses. Its earlier, and, perhaps, equally powerful action as a stimulant was thus utterly passed over, and indeed this same error seems to have influenced the minds of most writers in general medical literature. Skey, in a lecture delivered by him at St. Bartholomew's Hospital, though on a different subject, calling attention to this property of Opium, says, "In truth Opium is a most valuable stimulant of the vital powers," and goes on to show how often and in how many



ways we see its stimulant properties. It is this action then that makes it so useful and so beneficial in melancholia, affording the required stimulus to the exhausted brain.

There is another action of Opium, which, on the other hand, has been universally recognised from the very first, and will, I think, be denied by none. I mean its action in producing hyperæmia of the brain. Sir Astley Cooper, in his lectures on Narcotics, pointed this out as one of the first symptoms of poisoning by Opium, and this very property has been brought forward as one of the great objections against Opium, and is no doubt a most reasonable one in diseases, in which there is any pre-existing hyperæmia, any symptom of congestion. Dr. Stokes it was, I think, who first called attention to the great care and watchfulness required in its use in fever on this very account, how seldom it was even admissable, otherwise what a boon it would be to the physician in typhus, and I may say all fevers! What a comfort it would prove to the alienist physician in the treatment of acute mania, where the patient is worn out by want of sleep.

Now, although the pathology of melancholia, as of most mental diseases, is as yet shrouded in mystery, still we have made some advance on the ideas of our ancestors. Guislain and his followers looked on all insanity as the result of one morbid condition,—namely, hyperæmia—and attributed acute mania and melancholia to the same pathological changes, but now a days modern medical psychologists take an opposite view and look on melancholia as a symptom of a loss of vital power with anæmia of the brain. Professor Meynart, in his paper contrasting melancholia and mania, pronounces melancholia to be the expression of exhausted cerebration with deficient arterial supply.

Now assuming this theory of the defectively nourished condition of the brain, signalised by the interception of the thought current, we have apparently in Opium a physiological antidote if we allow that its action is to produce hyperæmia of the brain—an hypothesis which, I think, is scarcely denied. What then can be more appropriate in this condition of anæmia and exhausted nerve power than a drug producing increased action both of the vessels and



TABLE II.

Showing Results of Opium Treatment in 49 Cases of Melancholia.

	Discharged Recovered.	Still under Treatment, but Improved.	Still under Treatment, but Unimproved.	Transferred to another Asylum.	Died.	Total.
Males- . .	7	4	2	—	2	15
Females . .	24	5	3	—	2	34
Total . .	31	9	5	—	4	49

Of the 2 deaths amongst the males, 1 was due to congestion of the lungs, and 1 to dysentery. The 2 females died, 1 of cancer, the other of exhaustion after refusal of food previous to admission. Of the 3 females not improved, 1 had been a year insane before admission, and the other 2 have not been very long in the Asylum.

From these results, and from the following cases, I think, I may claim for Opium this much, (1st) that, when given in small doses, it acts as a direct tonic to the brain, (2nd) that its prolonged use when given in small doses is not prejudicial to the system.

That it acts as a direct tonic is shown by its quick effects in melancholia. How often do we see the wretched patient, whose whole thoughts are centred in his own misery without a care for anything about him, or a hope for the future, brighten up after a few doses of Opium, and even then begin to forget the imaginary sorrows, which for weeks have clouded his mind?

That it is not prejudicial to the system, I may be allowed to prove from the weight, temperature, pulse, and appetite of patients suffering under melancholia, who were taking it for a considerable time.

But again let me call attention to the smallness of the dose of Opium, given in melancholia in the West Riding Asylum. Fifteen minims of the Tincture combined with an equal amount of Sulphuric Ether, is the usual dose rarely exceeded, and I do not

think more than thirty minims has been given at any one time for many years, and to this I assign most of its good results, as, instead of interfering with the nutrition of the body in any way, it acts as a tonic to every part of the system. But as I have said before, the usual practice is to go on increasing the dose of Opium to the largest possible dose that can be borne, and so it is not to be wondered at that it should interfere with the nutrition of the system. There are certain cases where Opium has no effect, where no drug would have any effect, but we should not be justified on this account in increasing the dose till the system became intolerant of it.

*Sustained Action.*—One of the most universal cries against Opium, by the skilled and the unskilled, by him who takes it to assuage the thrill of pain or merely as a luxury to bring a pleasing train of fancies before his mind, is that it will act well for a time and then fail altogether, or else require to be increased to such exorbitant doses, as in time to tell upon the system, but such is not the result in melancholia—when once Opium has shown its good effects in this disease these are usually carried on to the end. As I before said, more than thirty minims of the Tincture has not been given here in any single dose, for many years in the numerous cases of melancholia, in which it is used, and still its good action goes on, as has been over and over again proved, by stopping the drug, when the patient has again fallen back into his original state of despondency, to be aroused once more by resuming the medicine.

That its administration as a medicine should lead to the creation of an acquired appetite for it, is an objection which no reasoning being could be supposed to make, and which might be classed with the late objections against Alcohol. With equal justice might we deny good diet to the insane, lest, when convalescent, they should become gourmands.

*Appetite.*—The effect of any drug on the appetite is one that certainly deserves the gravest consideration, and I suppose I shall not contravene the experience of all medical men if I say that a drug, whose effects are proved to be baneful to the appetite, should only be given where its other effects are of the greatest importance. Such an action would be

most disastrous in melancholia, where the patients are usually reduced to the lowest stage of weakness. But Dr. Clouston has found loss of appetite in all his experiments, which, indeed, is not to be wondered at when we look at the doses he used. No one need be surprised at loss of appetite after a 3 iss dose of Laudanum, but, in the whole number of patients treated with Opium in the West Riding Asylum, in only one case did I ever see loss of appetite produced by it. That one patient had just been admitted, and after taking her medicine for a day said she felt sick; however, on her medicine being stopped, she asked for it again. Except in this one case, I never heard of its having to be laid aside on account of loss of appetite, or of interfering with the digestive organs, and surely, if such were its usual effects, it ought to have occurred in more than one case. On the contrary, as the brain began to resume its normal functions, so, also, did the appetite return. And I may even go a step further, and say that the drug had a stimulating effect on the appetite. This, indeed, may be looked on as approaching the verge of improbability to all who have not watched the effects of Opium in melancholia, but that it has this effect, I think the following experiment will demonstrate:—

I took 10 patients, 5 males and 5 females, all labouring under melancholia and being treated with Opium, and gave them their medicine one hour before each meal, for three days, instituting thus 90 experiments in all. Now I may here be allowed to say that this is, perhaps, the most crucial trial that any drug could be put to, as regards its effect on the appetite, for it would be only natural to expect that if its action were prejudicial it would be certain to be manifested under such circumstances.

Of the 5 men experimented on, each was taking Tincture of Opium  $\mathfrak{m}_{xxv}$ . Three of them had been refusing food during the previous week, at times; the others, though they could not be said to have a good appetite, had never absolutely refused food.

1st meal: The three non-eaters refused their food at first, but afterwards took it with persuasion, the other two ate well.

2nd meal: One required feeding; two had to be persuaded, one of these had never before given any trouble, and two ate



well, one of these usually showing a disinclination for food.

3rd meal : All five took their food well.

4th meal : All seemed inclined for their food, and for the remainder of the day ate well.

7th meal : This morning all ate better than usual, and during the day seemed to have an improved appetite. At the end all said their appetites were improved ; they had no feeling of sickness ; their tongues were clean, and the attendant said he was relieved of all trouble with them.

The five women I will distinguish by the letters A, B, C, D, E.

A is taking Tinct. Opii and Ether Sulph. aa  $\mathfrak{m}\mathfrak{xv}$  ; has not eaten since admission ; tongue coated ; breath very offensive ; bowels costive.

B eats very well at times ; is the most intelligent and convalescent of the number ; tongue clean. Taking Tinct. Opii and Ether aa  $\mathfrak{m}\mathfrak{xv}$ .

C's appetite is poor ; tongue clean. Taking Tinct. Opii  $\mathfrak{m}\mathfrak{xxv}$ .

D always requires to be persuaded to eat. Taking Tinct. Opii  $\mathfrak{m}\mathfrak{x}$ .

E's appetite is very poor. Taking Tinct. Opii  $\mathfrak{m}\mathfrak{xv}$ .

The experiment was carried out in the same manner as with the men, each patient getting her medicine one hour before meals.

1st meal : B, C, and E took their food pretty well ; D required persuasion ; A was fed with a spoon.

2nd meal : B said she thought her appetite was rather increased ; C and E said they had no appetite ; D required persuasion, and A was fed.

3rd meal : D again required persuasion. On being asked why she would not eat, she said she was not worthy of food, otherwise her appetite was good ; B, C, and E took their food ; A was fed.

4th meal : This morning A began to eat of her own accord ; D this morning ate better ; C has still got a bad appetite ; B says hers is certainly increased since she began the medicine.

5th meal : A is eating well of her own accord ; C's appetite is much improved ; the rest ate well.

6th meal : A is now taking her ordinary food as all the other patients ; the rest also seem to have good appetites.

Third day: At the three meals to-day, all the above took their food very well. The two who are most convalescent, B and C, say their appetite is improved.

Now in none of these experiments does Opium seem to have had a prejudicial effect on the appetite. In no case did the tongue become foul, nor were there any symptoms of gastric irritation or disorder. On the contrary, in both men and women, it seems to have had a beneficial effect, *e.g.*, the woman A both improved mentally, as was shown by her taking her food of her own accord, and also bodily, as her tongue became clean, her breath less offensive, while her desire for food was increased. Of course the sceptic will say that all these results were *post hoc* and not *propter hoc*, but to him I can only answer that such results, even *post hoc*, are good.

*Weight.*—No observation can be of greater importance than the gain or loss of weight which takes place under the influence of a drug, taken for a length of time. Appetite, indeed, comes to be of little advantage when the food taken is found to minister no increase to the weight of the body, when food is proved not to be assimilated. But no results have been more wonderful than the rise in weight in nearly every case of melancholia treated with Opium.

Of the 49 patients, who last year were treated with Opium in this Asylum, 34 were females. Of these 25 gained weight, 6 lost slightly for a time, and 3 were not weighed, as they were confined to bed or were discharged too soon. Of the 15 men, 10 gained weight and 5 lost slightly.

These weights were recorded every month, each patient having been first weighed on admission.

The following is the table of the results:—

TABLE III.  
Showing the Gain of Weight by those Patients  
taking Opium.

	Weight on Admission.	Weight when last Weighed.	Total Gain.	Average Gain per Patient.
15 Males ... ..	2188 lbs.	2314 lbs.	126 lbs.	8 lbs. 6 ozs.
31 Females... ..	3654 „	4076 „	422 „	13 „ 9 „

The increase in weight of some individual patients was amazing, one man having gained as much as 37lbs. in 5 months. Now in this we see nothing of the advancement further on the road to death. It may be said that all this increase is only due to the liberal diet of the Asylum. Even granting that it was in great measure due to this, it must be allowed that the mental condition of the patients must have been improved before they could have received any benefit from nourishment, as, place the most dainty viands before a melancholic, and he will neither partake of them nor will he derive any benefit from them, if forced to eat, unless the brain can be aroused from its self-concentration, and the digestive powers, which are nearly always out of order, can be restored.

*Action on the bowels.*—That remarkable action of Opium in melancholia, pointed out first, I believe, by Dr. Tuke, in regulating the evacuation of the bowels, certainly goes far to increase its efficacy in the treatment of this disease, showing how appropriate it is, as a stimulant, for what can be a greater cause of melancholia than a deranged and constipated state of the intestines. Scarcely ever do we find in this form of insanity a healthy action of the bowels. That Opium has the power of rectifying any disordered action of this kind, all will agree who have watched its action in melancholia, though it may challenge the credulity of those who are accustomed only to its ordinary action in confining the bowels, but the same results have been pointed out to occur in lead poisoning, where in like manner the intestines, paralysed by the lead, refuse to act till the stimulus of Opium again sets in motion their peristaltic action. Dr. Tuke has pointed out that in melancholia, the nervous power of the whole body being below par, the intestines share with the other organs the want of directing force, so that the peristaltic action is diminished till it receives again the required stimulus.

*Temperature.*—Medical psychologists now a days, agree that the temperature in melancholia is below the normal standard. Nothing can be more pathognomonic of melancholia, than the dry, cold skin, the utter want of energy in the capillaries and arteries, so that the circulation is brought to the utmost degree of languor, the bodily heat being greatly reduced.

<sup>1</sup>Wunderlich gives the normal heat at 98·6° varying between 97·88° and 99·12°. In numerous experiments which I have made, I have found the temperature to be generally below this, varying in cases of uncomplicated melancholia between 97 and 97·40°. Dr. Skey says, "Opium is a most valuable stimulant of the vital powers—there is no drug simple or compound known to pharmacologists, that possesses an equal power with Opium, of giving energy to the capillary system, of promoting animal warmth, and thus maintaining an equitable balance of the circulation throughout the body." Dr. Clouston admits that this is the immediate result, though, according to him, there is an opposite effect when Opium is taken for any length of time, but here he is particularly hard on the drug, as he first condemns it for raising the temperature in mania, which he naturally says is a step in the wrong direction, and he again blames it for lowering the temperature in melancholia, which he says is also a step in the wrong direction, as the evening is higher than the morning temperature, remarking that "a high evening temperature, as compared with the morning temperature, represents a high mortality in the class of cases where this exists. Any drug to have a curative tendency, must reduce the evening temperature."<sup>2</sup> But according to Dr. Ogle's experiment on temperature in health at different hours of the day, the temperature between 9 and 11 o'clock a.m. is lowest, 97·73°, and between 6.30 to 7.30 p.m. is highest, and according to Wunderlich, the highest temperature is between 4 and 5 o'clock in the afternoon.<sup>3</sup> Does Dr. Clouston mean that the insane show symptoms of convalescence by an abnormally low evening temperature?

In the experiments I have made on melancholics, taking Opium with regard to temperature, I have found that its effect is:—1. To raise it at the time.—2. To raise it permanently.

1st. I took the temperature of a girl suffering from melancholia, taking  $\mathfrak{xxv}$  of Tinct. Opii in the morning

<sup>1</sup> *Op. cit.* Wunderlich, on 'Temperature.'

<sup>2</sup> *Op. cit.* 'Clouston on the use of certain drugs in Insanity,' *Medico-Chirurgical Review*, Vol. xcii., Oct., '72.

<sup>3</sup> *Op. cit.* 'Medical Thermometry Wunderlich,' pp. 100 and 101.

immediately before a dose of Opium, and again an hour afterwards, and I found as the result that there was always a rise between the two observations of an average of  $2^{\circ}$ .

2nd. I took the temperature of a number of patients labouring under melancholia, who were taking Opium. Some had only begun to take it, others had been taking it for some considerable period. The temperature was taken first in the morning before they got up, and again at night after they went to bed. The temperature invariably rose during the day towards evening. In fresh cases, where the treatment was only begun, the temperature, often so low as  $97^{\circ}$ , would usually vary between this and  $98.6^{\circ}$ , falling and rising with the patient's state, but always having an upward tendency, and in every case after taking the temperature for at least three weeks, I found the bodily heat to be nearly normal, in no case had it fallen under the effects of the medicine. These results will not be denied, I think, to be in the right direction, the returning nervous power being indicated by the return of the natural bodily heat.

*Diaphoretic action of Opium.*—Though Opium is said to lessen the secretions generally, all allow that there is an exception with regard to that of the skin, which it frequently increases to a large degree. Even in this age of doubt of all results from the action of drugs, no one has yet attempted to deny to Opium its power as a diaphoretic. And in what disease can there be more demand for a diaphoretic than in melancholia, in which the dry harsh skin has been a pathognomonic sign for all time. No remedy can bring permanent relief to the poor patient unless it calls into action the dormant secretion of the sweat glands.

*Pulse.*—The pulse in melancholia varies with the age and state of health of the patient. Generally we have a state of anæmia, with a murmur at the base of the heart, and a thrill with the pulse. This anæmic condition, often carried to an extreme degree in melancholia, signalled by the blanched face, the blue appearance of the conjunctivæ, and the colourless state of the mucous membrane of the mouth, is usually associated with a pulse varying from 80 to 100, very feeble and quickened with the least motion. In some cases there is an absolute demand for some preparation of iron in conjunction with





time, (b) preventing the disease advancing during the time the patient is under its influence.

L. H., *ætat.* 30, admitted March 20th, 1872. Six weeks insane; incoherent raving on religious subjects; visual hallucinations, tendency to suicide; and two attempts at suicide in six weeks. Patient says that after nursing she became thin and weak. The depressions were at first vague, but ultimately took the form of fear as to the loss of her soul, she fancied "that God would take no more notice of her." When she saw a knife lying before her, she felt she must cut her throat. She sometimes feared she would kill her children. When admitted had a large gaping wound opening into the trachia through which she breathed. Before admission had been taken from home for change of air, but with no good effect, as she then made the second attempt to commit suicide. She was very emaciated and anæmic, seemed to take little interest in anything. Her spirits were very low, she was always brooding over her own sorrows, but her memory and intellect were clear. Says she has heard voices in the air.

April 9th: Patient still continues in the same melancholy, wretched, and listless state. The wound of neck has quite healed up. Ordered *Tinct. Opii* *℥x* *ter in-dies*.

April 12th: Patient is still very depressed. She has all sorts of different delusions. Her appetite is a little better. Opium to be increased to *℥xxv*.

April 13th: To-day patient is much better. The act of cerebration is performed more quickly, and she takes much more interest in what is going on about her.

April 24th: Patient is now convalescent. She has ceased to have any delusions, and now works in the ward. She has lost that haggard listless cast of countenance.

Here the effect of the Opium was most marked, as its power was shown not only in its speedy effects in allaying the fears and anguish of the poor woman, but in its effect on the general health. Nothing could be more wonderful than the change in her appearance and general health. She lost her ghastly hue, her appetite increased, she gained wonderfully in weight during her stay. The following weights were recorded of her each month:—

Weight on admission,	87lbs.
„ after 1st month,	95lbs.
„ after 2nd month,	98lbs.
Gain of	11lbs. in three months.

Her temperature was high at the beginning, for melancholia, but this can be accounted for as the result of the wound in her neck; however, it became more steady and closer to the healthy line under the influence of Opium.

Her pulse varied very much at first, for a similar reason. It was also very weak and intermittent at times, but gained in every way as the treatment went on, both in strength and regularity of beat. Her appetite, which was at first very poor, increased every day; her tongue cleaned, at first covered with a white fur, it became quite healthy; her bowels, at first very constipated, became regular (perhaps one of the most telling features in her case); the catamenia also became regular.

M. W., *ætat.* 27, admitted Dec. 30th, 1871. Patient has the appearance of

one who is greatly depressed ; takes no interest in anything going on about her ; says that she has been very strongly tempted to destroy herself, and has often meditated doing it, as “ she could not see her way through the world ;” neglects herself and her household duties, and is constantly moaning and crying ; has told several of her friends that she intends to destroy herself ; she fancies she cannot manage properly for her husband and children, and this has preyed on her mind. Patient is thin and emaciated ; her eyes are red with weeping ; her tongue is dirty ; her bowels costive, and she complains of loss of appetite and pain in the head ; catamenia have not appeared for two months ; her temperature is 97°, and her pulse 100 and weak.

Jan. 9th, 1872 : Patient is very miserable, and fancies her children must die, if not now dead, as her husband can't support them. Ordered Tinct. Opii ℥xv.

March 23rd : Patient, under the effects of Opium, has made a most decided and rapid change for the better ; she is now quite rational ; has lost all her foolish delusions about her children ; her general health has also improved ; tongue is clean ; appetite has improved ; the catamenia have appeared once ; the bowels are regular.

March 25th : Patient is now convalescent ; has lost all her foolish ideas ; health good ; temperature 98·4° ; pulse 72.

Discharged, recovered, April 9th, 1872.

The next case is, perhaps, one of the most interesting as proving, in a decisive way, the good effects of Opium, as the patient had suffered from a previous attack, at no time more violent than her second attack, and yet she lingered on in the same depressed state for eight months and a half, and was admitted again two months after she was discharged. In this attack she was immediately put on Opium, and in 23 days she was quite convalescent, though nothing could have been more wretched than her state on her second admission.

A. E., ætat. 44, admitted Dec. 1st, 1871. Six months insane before admission. When admitted was said to be suicidal, and had torn her clothes ; would not speak and refused her food.

She was discharged cured on Feb. 12th, 1872.

Re-admitted April 11th, 1872. One week insane ; she was then in a very low dejected state, refused to take food, and had to be fed with the stomach pump ; the bowels had not been moved for 11 days ; the tongue was foul, and the breath offensive. Ordered Ol. Croton ℥ij, and to have Tinct. Opii ℥xv ter in-dies.

April 12th : Patient has a most dejected look, utterly careless of everything and everyone around her ; to most questions she will answer nothing, and still refuses all food.

April 15th : Patient is wonderfully improved ; she has begun to eat of her own accord, and she has lost that very dejected look ; bowels are now regular ; her tongue is clean, and her breath has lost the offensive odour. To continue the medicine.

April 17th : The improvement in patient still continues ; she now takes her food very heartily ; her tongue is clean ; her bowels are regular ; she employs herself in the ward ; has lost that very dejected look, and will enter into conversation with any who speak to her.

April 23rd : Patient is now convalescent ; her appetite is very good, and her general health quite recovered.

In this case Opium had a wonderful effect, not only on the mental, but also on the bodily symptoms. She increased in weight, as she gained 7lbs. in the first month she was in the Asylum—her weight being 117lbs. on admission, after one month 124lbs. Her temperature rose, and her pulse became stronger, both were carefully noted for the first three weeks after her admission. The sudden rise of temperature is most marked as it was only  $96\frac{1}{2}^{\circ}$  when first recorded, before the medicine was begun. It again fell to  $97^{\circ}$  when she had a slight relapse.

Her pulse was very steady for the greater part of the time.

E. M., ætat. 26, admitted Oct. 9th, 1871. Insane six days. Described as sitting moping with her eyes downcast, apparently unconscious of anything going on around her. When questioned she only occasionally attempts to reply, most frequently she only sobs and cries. Her husband says that for two or three days she has been inattentive to the calls of nature. Six months after the birth of her last child she became melancholic, and was sent to Macclesfield, where she recovered. After returning home she heard of the death of her child, and began to mope and became dirty in her habits ; she is now in a state of great misery ; her face is quite red with weeping ; will not employ herself in any way ; says she has murdered her children, has merited the displeasure of her husband, and that he will have nothing more to do with her ; her bodily health is poor, body thin, appetite bad, tongue dirty, bowels constipated.

Oct. 15th : Patient has been very restless all night, and this morning is extremely depressed ; has eaten very little, and will take no interest in anything around her.

R Tinct. Opii.

Ether Sulpt. aa ℥xv, ter die.

Oct. 30th : A decided improvement is observed in the patient ; she looks brighter, and seems to take more interest in those around her.

Nov. 2nd : Patient is improving very much ; Opium has a most marked effect on her, as when omitted, even for a day, she sinks again into her old state of depression and lowness.

Nov. 10th : Patient is now much improved ; she employs herself, and is very cheerful and happy. To continue the medicine.

Nov. 14th : Patient has been taking Tinct. Opii since the 15th of Oct. with the most marked benefit ; she is now convalescent ; no remains of her mental malady, and in appearance she is quite a different woman ; now bright and happy ; has lost her worn look ; she takes her food, and sleeps well ; tongue clean ; bowels regular ; has gained weight.

Weight on admission, 120lbs.

„ after 1st month, 136lbs.

„ after 2nd month, 141lbs.

Gain, 21lbs.

Her temperature was taken for the first three weeks. Here again was seen the returning convalescence marked by a rise in the temperature, as from the beginning of November. when the improvement commenced, the temperature gradually rose, and by degrees got up to normal.

The following case is one of the very best illustrations of the good effect of Opium, as here we have its action compared with that of other drugs. The effects of Bromide of Potassium, combined with Iron and Belladonna, were first tried, but without avail, whilst under the influence of Opium she rapidly got better. Curious to say, she also lost weight and flesh under the other medicines, which she rapidly regained under Tinct. Opii:—

A. B., ætat. 40, admitted Sept. 4th, 1871. Has been for ten weeks in a desponding condition. Since admission she has been constantly crying and lamenting her condition; has a delusion that she is dangerously ill and is about to die, she is very depressed and miserable; has not, however, seen visions nor heard voices, nor does she complain of any giddiness; her digestive system is very much out of order; appetite very poor; bowels constipated; she complains that she does not sleep: catamenia have not appeared for two months. Ordered Iron and Bromide of Potassium.

Sept. 13th: She has continued the medicine without any effect, as she is very noisy, bewailing her condition night and day. Ordered Tinct. Belladonna, 3 ss ter in-dies.

Sept. 15th: No improvement in patient's condition; she now refuses her food, and requires to be fed with the stomach pump three times a day.

Sept. 28th: Patient still continues in the same state. Belladonna has had no effect on her, as she is very restless and moans all night long, so that she has to be moved to a single room. Ordered—

Rx Liq. Opii Sed. ℥xx.  
Sp. Ether Nit. ℥xv.  
Ter in-dies.

Oct. 20th: Patient has improved very much under the Opium, as she is now a different woman; has become quite tranquil, and sleeps well with the other patients.

Jan. 13th: Patient still continues the medicine and is now quite convalescent; she employs herself in the ward, and is very cheerful.

Feb. 26th: Patient has continued Opium all this time; she is now quite recovered; her appetite is very good; bowels are regular; tongue clean; catamenia appeared last month and again last week.

Her weight will be seen to fall under the Bromide and Belladonna, and to rise rapidly under the Opium treatment.

Weight on admission, 125lbs.

„ after one month under Belladonna, Bromide, and Iron, 120lbs.

„ on discharge after being four months under Opium, 127lbs.



Here the effects of Opium can be compared with that of other medicines, and the result speaks highly in its favour.

This case also bears out what has been said as to the effects of a continued course of the drug. The patient took *Liq. Opii Sed.* ℥xx for more than four months, and, under it, her appetite increased, her bowels became regular, her general health improved, and she gained weight.

In the next case recovery was delayed by an attack of diarrhœa. Except for that the progress was favourable, as the patient was in a very wretched state on admission.

H. B., ætat. 46, admitted Dec. 24th, 1871. Patient is very incoherent in her conversation, weeping and lamenting continually; refuses all food, and has twice attempted suicide by hanging; tongue dirty; breath foul; catamenia have not appeared for two months.

Jan. 4th, 1872: Patient is suffering from an attack of diarrhœa, for which she has been treated by Sulphuric Acid and Opium and *Pil. Cupri. Sulph. é Opio.*

Jan. 10th: Diarrhœa better. Ordered *Tinct. Opii* and *Ether Sulph.* aa ℥xv, *ter die.*

Jan. 16th: Patient is better mentally, but her appetite is still poor; tongue clean and moist.

March 20th: Patient is now convalescent; she has been taking Opium for two months with great benefit, and without any bad effects; her tongue is clean; her appetite is good; she sleeps well, and has gained weight; the catamenia appeared last month. Her increase of weight is most remarkable.

Weight on admission, 130lbs.

„ after 1st month, 133lbs.

„ after 2nd month, 139lbs.

„ after 3rd month, 140lbs.

Gain, 10lbs.

Her temperature, which was taken a short time after she was put on Opium, shows an upward tendency, with a very decided morning fall at first, which, I think, is explained by the natural tendency of the temperature always to keep very low in this disease, except when raised by the stimulus of Opium, till at length the returning nervous power raises both the morning and evening temperature nearer the normal line. The medicine of course, when administered only during the day, cannot influence the morning temperature so much, as its effects have worn off during the night.

M. A. A., ætat. 22, admitted Oct. 14th, 1871. Patient is described as sitting moaning and crying all day long; scarcely eats or sleeps; has attempted suicide in various ways, and was detected in the act of walking into a well with her child; will not do any work or take any interest in surrounding objects; her body is much emaciated, and her digestive system is much out of order.

Oct. 21st, 1871 : Patient now appears to be under the influence of great fear for some unknown object ; she looks utterly wretched, and has hardly eaten or slept since her admission. Ordered Opium and Ether.

Nov. 20th : Patient is improving under the medicine ; she has stopped weeping and moaning, and employs herself in the ward, and the nurse says she has become most useful.

Feb. 1st : Patient is now quite convalescent, and has become cheerful and happy ; her bodily health has also greatly improved ; her appetite has improved and bowels act regularly. She has gained immensely in weight as the following table will show :—

Weight on admission,	100lbs.
,, first month,	112lbs.
,, second month,	115lbs.
,, third month,	125lbs.

Her temperature was very near the normal line throughout ; only once did it fall much below when it went down to 97°, but again rose to 98½°.

E. S., ætat. 52, admitted Nov. 17th, 1871. Married. Appears very melancholy and depressed. Her husband says she is constantly talking about the state of her soul, and wishes to go to heaven. She also said she was going to drown herself. She has delusions about religion, and is afraid she won't be saved, and says she thinks of it night and day ; tongue is clean ; bowels regular ; but appetite poor.

Nov. 21st, 1871 : Ordered Tinct. Opii ℥xv thrice a day.

Dec. 19th, 1871 : Patient is much improved, though she is still at times low and depressed ; her affections, which she had lost when she came in, have returned, as she showed great delight at seeing her sister to-day. She is still taking the Opium.

Jan. 16th, 1872 : Patient has greatly improved under the medicine. To-day it was discontinued, as she is quite convalescent ; tongue clean ; bowels regular ; pulse 72 ; temperature 98·4° ; has gained weight.

We now come to a class of cases to which I referred before as examples of the second result of the treatment of melancholia by Opium. I allude to those cases in which the disease was recurrent, and where I have found Opium show its effects even, perhaps, in a more remarkable manner than where permanent recovery takes place. Under its use the patient becomes first convalescent, but, when the medicine is left off, a relapse takes place. Again and again, under its influence, they are cured for the time, and very often obtain an ultimate recovery. But certainly the action of Opium, in this class of cases, is wonderful, as, under its influence, the patients become, to all appearance, convalescent, but, as soon as it is left off, they again relapse. From these results I have claimed these three actions for Opium in these cases :—1st. That it causes the symptoms to disappear

for a time. 2nd. That it prevents the disease advancing during the time the patient is under its influence. 3rd. That it gives support to the system.

In the first case its effects were most remarkable as on admission, nothing could be more precarious than the state of the patient. She was suffering from most desperate self-inflicted wounds, and in the very lowest state of anæmia, wretchedness, and despondency, yet, in spite of all this, she rallied for a time, gained both bodily and mental health, the wounds healed, and she seemed in a fair way to a permanent recovery. In the first month she gained 8lbs.; her bowels became more regular; tongue clean; and she gathered strength rapidly, considering her dangerous state. However, the favourable mental symptoms disappeared when the medicine was left off, again to return with its renewal. The bodily health also fell off when the medicine was discontinued, as she lost weight.

S. F., ætat. 49, admitted July 8th, 1871. Widow. Family history.—Her son was melancholic and suicidal; her nephew committed suicide and others of her relatives have been confined in asylums. She was described as very suicidal, having sought death in three ways :—1. By cutting a vein in her arm. 2. By cutting her throat. 3. By beating in the vertex of her skull with a flat iron. When admitted she still bore the marks of these injuries, and was in a most wretched state; part of the frontal bone was exposed from sloughing of the scalp, and had a most unhealthy appearance; her body was greatly emaciated; her mental state was very low; she suffered from great depression of spirits; fancied she was about to be apprehended by the police for taking goods belonging to others; said she felt so low and desponding she was obliged to commit suicide; pulse 90, feeble; tongue clean; bowels confined. Ordered Liq. Opii Sed. ℥xx ter die. Patient was so weak she had to remain in bed.

Aug. 7th: Patient has gone through a great deal of suffering from the wound in her head, which is now much better, and her mental state is also somewhat improved.

Aug. 23rd: Patient's improvement has continued, so much so that she may now discontinue the medicine.

Sept. 12th: Patient is again depressed; she is wandering about praying every one to save her from being smothered, and seems to suffer from great terror. To resume the Opium.

Oct. 9th: Patient looks again improved, and says herself she feels better. Medicine to be discontinued.

Oct. 27th: Patient has again sunk to her former state of wretchedness; now refuses to feed herself, says she is not worthy of it. Her bodily health, which before she left off the Opium, was greatly improved, has also relapsed, as she has lost weight. There is an air of great despondency about her face. Ordered Tinct. Opii and Sp. Chloroform aa ℥xv.

Nov. 8th : Patient is much better ; has a more cheerful look about her face ; takes her food fairly ; sleeps well, and employs herself during the day by knitting.

Dec. 1st : To stop medicine, as she is again nearly convalescent.

Dec. 23rd : Patient is again very depressed, and will do no work, but wanders up and down in a very hopeless condition. To begin the medicine again.

Feb. 27th, 1872 : Patient is again improved and convalescent.

This case was, perhaps, one of the most hopeless imaginable. On admission she was so emaciated, and her wounds were so bad that her life was in a critical position, but at first, under the effects of Opium, she rallied wonderfully. She gained both health, and strength, and weight. However, when the medicine was given up, she again and again relapsed.

Subjoined is a table of her weight, showing the rise under Opium, with the loss after its omission :—

Weight on admission, 100lbs.

„ 1st month, Opium, 108lbs.

„ 2nd month, Opium left off, 99lbs.

The constitutional symptoms caused by the wound prevented her temperature giving any results worth recording.

Her family history is so unfavourable, one could never have very much hope of her ultimate recovery.

The following is another case to show the effect of Opium, as, at any rate, a palliative medicine. As she was twice put on Opium, and twice became convalescent, but, each time it was stopped, she became low again.

A. H., ætat. 53, admitted May 19th, 1871. Married. Has made numerous attempts to commit suicide, the last only the day before admission. Says her ideas became confused, and she felt very miserable, and, as she expresses it, "Not in her right mind," and made an attempt at suicide.

July 5th : Up to this she has been very quiet and orderly, but to-day seems rather low-spirited ; last night wandered about the dormitory, tearing her hair and in a state of great mental pain. To have Tinct. Opii ℥xxx.

July 6th : She slept during the greater part of the night, but is restless and agitated this morning. Refuses her food.

July 11th : Patient is still rather despondent, but is taking her food much better during the last few days.

July 16th : Omit Opium as patient is much improved.

Sept. 17th : Patient is again much depressed and agitated ; takes her food badly. To have Tinct. Opii Sp. Ether Nit. aa ℥xxv.

Oct. 17th : Patient is again convalescent. Medicine to be stopped.

Jan. 16th, 1872 : Patient is again very low and depressed. Ordered Tinct. Opii Sp. Chloroform aa ʒij Aquæ.

Jan. 30th : Patient is again much improved. Medicine to be stopped. Patient, since admission, has gained 20lbs.

Table of A. H.'s weight :—

On admission, 95lbs.

1st month, 100lbs.

2nd month, 104lbs.

3rd month, 110lbs.

4th month, 115lbs.

From the above experiments and cases I have endeavoured to show that Opium, when taken in small doses, and given in cases suitable for it, has not those prejudicial effects usually ascribed to it, and, further, that it may be continued for a very considerable period, without interfering with the proper nutrition of the body, lessening its weight or hurrying it one step further on the road to death. On the contrary, it appears that, acting as a stimulant, it gives nourishment to the trophic centres, and, at the same time, it has a beneficial action on the body, increasing the secretion of the skin, regulating the action of bowels, raising the temperature, and strengthening the pulse.

But one action of Opium I have not yet considered, one which, perhaps, was the cause of its being first brought into use in this disease, and one, which, described in all the rosy tints of one of the most beautiful word painters of modern times, is made familiar to us all. I allude to its action in causing the formation of groups of happy thoughts which pass through the brain while under its influence. "I, it will be admitted," says De Quincey, "must surely now know what happiness is, if anybody does.

\* \* \* And, therefore, I will here lay down an analysis of happiness. \* \* \* Fifty and two years' experience of Opium, as a magical resource under all modes of bodily suffering, I may now claim to have had."<sup>1</sup> At any rate, everyone is well aware that the action of Opium is to cause certain dreams in the mind of the person under its influence, in which he sees before him pictures continually changing, and which are usually painted in the very brightest hues. What other drug could then hold forth such advantages to the melancholic, sunk in the abyss of hopeless despair, weeping

<sup>1</sup> *Op. cit.*, De Quincey on 'Opium,' p. 226.



over sorrows that have no existence, and flying from phantom fears? Does it not seem that to him Opium would be an elixir, bringing back the pleasures of a life which has been long hateful, and only to be got rid of by every possible means? But it may be said that this effect of Opium can be only obtained by large doses, increased from day to day to such an extent as, by degrees, to become hurtful to the system. Certainly in De Quincey's case such was the result and so it is with nearly all Opium eaters. To secure such vivid effects it would, no doubt, be requisite that the medicine should be increased, but this does not prevent it from having a continuously beneficial action, though in a less degree, when kept within proper limits.

By what physiological changes it is that Opium causes these dreams of happiness, I should think no one has ever attempted to explain, and it is doubtful if physiology will ever climb so high as to show the changes in the brain matter necessary to produce a state of joy or a state of sorrow. Thus far, however, we have learned from pathology that symptoms of wretchedness and misery are most likely to be associated with an anæmic brain.

In conclusion, I think I cannot be accused of claiming too much if I say that no drug, at present known possesses actions which meet so well the different symptoms of melancholia.

# IMPAIRMENT OF LANGUAGE, THE RESULT OF CEREBRAL DISEASE.

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WHILE it is proposed in the following pages to regard aphasia from a somewhat new point of view, and as comprehending other modifications than mere deprivation of language which nullify or impair the articulate expression of thought, it may be expedient to premise a very brief epitome of certain of the opinions, and especially the positive opinions, which connect forgetfulness of words, &c., with change in the cerebral structure.

I. Gall, holding that the representation of ideas, feelings, and other mental states, by means of external signs, and above all by articulate words, was a distinct or specific faculty, announced that he had various grounds for believing that this power was connected with, or manifested by, the posterior central orbital convolution of the anterior lobes. He held that in this place there were two separate organs for two distinct capacities, one the recognition and recollection of words, and another the perception of the relations of these, or philology. These grounds consisted chiefly of cases in which injuries or diseases in this part of the brain were followed by some form of aphasia, and the observation of the size of the convolution alluded to, as indicated by the degree of impingement of the orbital plate upon the orbit and consequent protrusion of the eye, and the capacity for acquiring and using languages. Many of the cases of change

in the cerebral structure recorded by Gall, Belhomme, and his other followers, were open to the objection which seems fatal to all of those adduced in support of M. Broca's theory, in being confined to one hemisphere; but they never supposed that the organ was unilateral, and that its function could be destroyed or interfered with unless a similar change or sympathetic action involved the convolution on the opposite side.<sup>1</sup>

Professor Sanders, in his interesting memoir,<sup>2</sup> admits that the origination of the views now in one form, or other so prevalent, is to be traced to the phrenologists, but in less distinct and complimentary terms than might have been expected from one whose father was a distinguished leader of that sect of psychologists in Edinburgh. Dr. Bateman,<sup>3</sup> in his most valuable and exhaustive treatise on this subject, to which we have been greatly indebted, after making due allowance for the imperfect state of anatomical knowledge at the time when Gall observed, pays a merited tribute to his labours and discoveries, and concludes by saying that "his researches gave an impulse to the cerebral localization of our faculties, the effect of which is especially visible in our own days." Dr. Maudsley,<sup>4</sup> adverting to Gall's statements, attempts, upon what he considers philosophical grounds, to show the fallacy of regarding that power or state of consciousness, for assuredly there is such a power, by which words as signs of thought are invented, or acquired, or recognised as a specific and independent mental faculty, and endeavours to reduce the localization of such a power to an absurdity by giving a fanciful description of fibres passing from ideational convolutions to that convolution supposed to be connected with the faculty of language: yet no writer seems to be more cognizant than he is of the necessity for devising some cerebral mechanism by which the process of converting subjective mental states into objective words may be effected. He writes "the ideation which takes place in the cells of the cerebral convolutions passes thence downwards along the radiating fibres to the motor centres of speech and excites in them the associated

<sup>1</sup> Gall 'Sur les Fonctions du Cerveau.'

<sup>2</sup> 'On Aphasia,' *Edinburgh Medical Journal*, Vol. XI., pp. 811 and 1042.

<sup>3</sup> 'On Aphasia or loss of speech in Cerebral Disease,' in Nos. 64, 65, 67, 68 69, and 71, *Journal of Mental Sciences*, 1868 and 1869.

<sup>4</sup> 'Lancet,' Vol. II., (New Series) pp. 690 and 721.

motor intuition which has been organised there by education. This done we have in the mind the word appropriate to the thought, the name with which the idea has been associated." It is far from our intention to controvert this hypothesis, which is held by many distinguished physiologists, but we experience great difficulty in understanding, not so much how education of the organs of phonation should excite a motor intuition, but how the motor intuition can become a sign, a representative of an impression, either objective or subjective, recognisable in the ideational cell, or, in other words, in consciousness. We shall not even venture to theorise at all, as, before attempting to generalise, or to draw sharp and rigid deductions from forgetfulness of words as signs of ideas, it will be absolutely necessary greatly to enlarge our investigations as to the other forms and degrees in which the employment of articulate language appears, and to determine the relation which subsists between the act of ideation and the creation or recognition of a sign or sound representing the ideas and the volition by which external expression is given to that sign or sound by the vocal organs, or by other muscular arrangements.—*e.g.*—It is one step in the process to perceive, to recollect, or to fancy, the qualities of shape, colour, taste, &c., which constitute the image or impression in consciousness of an apple, and this step may never be succeeded by any other; it is a totally different and more advanced step to devise or to learn from others that there have been devised certain sounds or signs called letters, such as apple, pomum, &c., which shall represent to the individual mind, or to the minds of others, the qualities of the said fruit, and it is a third and totally different step, although all three may be consensaneous and almost contemporaneous, by which the will calls into activity certain groups of muscles, &c., and external utterance is given to the word apple as the sign of the existing state of consciousness.

II. Bouillaud, in 1825, observed 114 cases in which disease of the anterior lobes was accompanied by loss of the memory of words. He likewise engaged in experiments upon animals with the same object in view, and came to the conclusion that the faculty of speech was localized in one or

more of the convolutions of these lobes. M. Bouillaud still lives and supports this conviction.—M. Trousseau appears to have concurred in this opinion.—Andral's testimony is not so favourable to this view, as in 37 examinations of disease of the anterior lobes, alteration of speech occurred in 21 only.

III. Darx recorded 140 cases of disease of the left hemisphere, accompanied with aphasia, and right hemiplegia and concluded that the faculty of language must be connected with the left hemisphere. Trousseau so far corroborated this experience by finding in 134 cases of aphasia, disease of the left hemisphere in 124 while 10 were contradictory of Darx.

IV. Darx, junior, places the organ of the manifestations of thought by speech at the point of union of the middle with the frontal lobe of the left hemisphere.

V. Broca independently, and, it is believed, in ignorance of the observations of the MM. Darx, struck by the occurrence of aphasia with right hemiplegia in a patient in Bicêtre, on whose death disease of the third left frontal convolution was detected, extended his inquiries, and, obtaining evidence of what he regarded as the invariable association of these three morbid conditions, adopted the opinion that the third frontal convolution of the left hemisphere was the organ of articulate language. Of 32 cases of aphasia, Trousseau found 14 confirmatory of, and 18 in opposition to the position of Broca. It must be added that in 2 cases the same physician detected disease of the third right frontal convolution in connection with aphasia, and the converse has been noticed where disease in the left third frontal convolution was not accompanied by aphasia. Aphasia or amnesia again has been observed where no structural disease of the anterior lobes could be detected by dissection or microscopical examination. A very large number of dissections show that whatever may be the inference, modifications of language, or the loss of the memory of words, have not been found to correspond with the disease of the left frontal convolution, the insula Rieli, or neighbouring parts, but of other parts of the encephalon of various arteries supplying the brain of the tuber annulare, medulla oblongata, &c. But much more



remote lesions or conditions appear to determine the abolition or modification of language, amongst which may be enumerated, spinal irritation, hysteria, neuralgia, intestinal irritation in children, narcotism, and blood poisoning, critical and catamenial changes, &c., and, so far as any conclusion is justifiable during the life of a patient, the same want of correspondence may be held to exist in the numerous cases of left hemiplegia with aphasia, of which not less than 6 have been noticed in this hospital. Baillarger, in like manner, records 155 cases of hemiplegia, of which only 10 were upon the left side, from which it would appear that in aphasia right is to left hemiplegia as 15 to 1. It must, however, be always kept in mind, in all deductions as to the presence, or absence, or relative frequency of hemiplegia, that softening, &c., of the whole anterior lobes has been observed without the occurrence of any paralysis whatever.

VI. Schröder Van der Kolk imagined that loss of language depended upon disease of the olivary bodies. Not only was his crucial case unfortunate, being that of an idiot, but subsequent explorations have not tended to support this hypothesis, nor is there any evidence that these portions of nervous matter are either wanting or disorganised in the dumb.

VII. It has been held, we shall not say how fancifully, that as the left hemisphere must be educated, or in some way influenced, by the training of the right hand in writing, &c., so it may be educated or influenced in and by the volitional acts, in acquiring and using words, and thus become the organ or instrument of language, and that of course disease of its structure will produce aphasia, as well as right hemiplegia. We cannot well comprehend this proposition, nor how the act of uttering words, or the instruction which enables an individual to connect these with certain mental states, or to employ them as signs of ideas, whether new or old, can create or elevate any part of the brain into the position of an organ or source of power, if there be no original and inherent function of receptivity or capacity in the part itself. But, perhaps, the untenableness of this doctrine may be sufficiently illustrated by the universality of right handedness even in the lowest and least

educated tribes and classes, in idiots, in deaf-mutes, by the exceptional cases of left handedness, and by aphasics acquiring the power to write with the left hand.

VIII. Certain psychologists conceive, that, postponing the inquiry as to the localization of particular powers until further evidence is obtained, the loss or limitation of the power of language must be accepted as an indication of disease of the intellectual powers generally. Trousseau<sup>1</sup> appears to be disposed to accept such a solution of the existing difficulties and contends that in almost every case of aphasia, there are likewise impairment of memory and mental perversion and perplexity, in this he is correct, but to this extent only, that the general mental defect is the result of, and in exact proportion to the obliteration of the means by which the process of thinking is carried on, of those signs upon which the thinker himself depends for evolving and rendering palpable and permanent to himself and to others his subjective impressions. It must be remembered also, that in aphasia with hemiplegia there is proof, almost inexpugnable, of the presence of grave lesion in some part of the cerebrum, which, to whatever extent it may affect the power of language, must disturb the functions of the whole organ, Trousseau himself affords a sort of refutation of his theory when describing the power of a lawyer to discuss abstruse points of law while labouring under occasional aphasia. In dealing with this question there should be analysed such examples as that of Professor Lordat, to be afterwards alluded to; of a musician who wrote down musical notes; of educated patients who continued to write sensibly after they had ceased to speak, and had a distinct consciousness of their own infirmity; and of others, less gifted, who, though articulating no complete word could play draughts, dominoes, &c.

These speculations shall not be further pursued, except in so far as they may illustrate the different forms and degrees presented in the use of language as expressive of the various mental conditions.

(a.) Total aphasia is perhaps the form in which modification of articulate speech is most familiar. It may be voluntary and

<sup>1</sup> 'Trousseau's Lectures on Clinical Medicine,' 1866, Bazire's Translation.

certain of the individuals, who, labouring at the same time under mental disease, have remained mute for 2, 10, or 20 years, may have willed to be silent; but, in general, the symptom succeeds grave and irreparable structural lesion. It is, moreover, remarkable that occasionally not only are oral signs obliterated from memory, but that all natural language, gestures, and even facial expressions have been lost. This cannot be supposed to be applicable to deaf-mutes. In other patients the power of using written or visible signs, shares the same fate as that of employing oral signs, and a curious modification of this deprivation was met with by Dr. Gairdner, where an individual, although he could not represent his own thoughts in writing, could copy the writing of others.

(b.) An almost imperceptibly less degree of impoverishment of the use of external signs was supplied in the case of a patient who recently died in the West Riding Asylum. He laboured under left hemiplegia, with tremors and lessened motility of the other limbs, and the autopsy showed disease of the cerebral arteries, general softening, local softening, and minute extravasation especially in the left hemisphere, and marked wasting of the anterior, and parietal convolutions. On admission the only mode of communication possessed by this man was limited to an expiratory noise such as may be heard in deaf-mutes, and to movements of the hands as if in search for words; for a time he regained a few monosyllables but died aphasic.

(c.) It is instructive to notice how very limited the natural or artificial modifications in the formation of the local sign of thought may be. One case of complete recovery from aphasia is recorded by Bateman, in which the only permanent loss sustained was of the letter P. Another is given by Trousseau, where, although other letters could be articulated in imitation of another speaker, P could not. A third, and more curious instance, is stated, on the authority of Graves, where no initial letter could be recalled, although the words rose before the memory, unless by reference to a dictionary, or by hearing the letter pronounced, and this oblivion extended to the names of the patient's own children. These minute impairments from disease

must be regarded in connection with the facts, that certain celtic nations are said to ignore the existence of the letter P; that the Hurons and Iroquois fail entirely to pronounce the labials, and the Indians of Port au Francais do not possess seven of our consonants, and, moreover, that La Hontun spent four days in vainly endeavouring to teach a Huron to pronounce B, P, and M, and lastly, that Seguin encountered difficulty in teaching idiots certain letters, and found that they can articulate consonants more readily than vowels. Many of this class not being deaf-mutes never attain a greater range of articulate signs than Pa, Bo, and similar monosyllables. It may be imagined that in certain of these examples the impediment consists in imperfection of the organs of phonation, but it is intelligible that the deprivation or non-development of a solitary element in the construction of language should depend upon an enteeblement or suspension of general mental laws. Trousseau concurs with the illustrious Condillac in the principle that language or signs of some kind are necessary to thought even in minds of the highest order, and where abstraction is constantly resorted to, and admits the existence of memories of different kinds, such as of things, words, notes of music, &c., but he has shrunk from the difficulty involved in the admission, that a part of a sign can be destroyed while, practically, the remaining parts are correctly employed, and the general integrity of the mind is not interfered with.

(d.) A similar view may be taken of instances where syllables or parts of words, or single, or particular words, or phrases, are retained, and whether used correctly or not, or merely as expletives of natural language, constitute the only articulate signs of thought. Thus in Broca's fundamental case where insanity was succeeded by paralysis, and right hemiplegia found to depend upon disease of the left frontal convolution, the only vocal means of expression for ten years was the syllable "tan" and an oath; in another four words, "oui," "non" used correctly "toi" used to express number, the actual units being indicated by the fingers, and "toujours" comprehending all members of the unknown vocabulary, but amplified and explained by mimicry and gesticulation, were the only words

uttered. A third is described by Hasbach, where a long word "Gerechter Gott" was recollected as a whole, but, where the letters, or parts of which it was composed, could not be articulated; and Trousseau supplies a fourth, Paquet, whose language was confined to the syllable 'cousin,' and who, though so far mentally confused, as vainly, and for long periods, to attempt to read continuously, could play draughts and dominoes dexterously. It is not a satisfactory explanation of these phenomena to affirm that a paralysed limb can perform certain movements, movements, perhaps, to which it has been habituated, but not others, for, were the cases parallel, all exertions of the muscles engaged in articulation, in the same direction, or combination, or, to speak more precisely, in the formation of words consisting of the same letters as those actually pronounced, would be practicable. In connection with abbreviation or algebra of language, where one sign, or part of a sign, is made to stand for a number of mental qualities, or a concrete idea, a brief allusion to the symptoms of general paralysis cannot be omitted. In this affection, some of the chief psychical characteristics are the loss of the memory of words, or parts of words, generally the terminal syllables, and the most glaring errors in orthography. There is, at the same time, not merely the exhibition of this deficiency in writing, but a hesitation and curtailment of the words in articulation, which were formerly described as *entre coupé*. In the original monograph of M. Calmiel, 64 cases are detailed, and of these 61 presented this peculiarity, in 1 it was absent, and in 2 no allusion is made to its presence. A very interesting case bearing closely upon this feature occurred in my own practice, and has been described, I think, in the 'Edinburgh Medical and Surgical Journal,' about 20 years ago. A deaf mute, labouring under general paralysis, was placed under my care, when, after as careful an investigation into his physical and mental state as was practicable in his peculiar isolation, in which I was aided by a teacher of the deaf and dumb, it was discovered that he had great difficulty in communicating, by means of artificial signs, omitting the terminations of words in his finger language, and spelling almost every word incorrectly. Haslam believed that a similar deprivation was detectable in chronic maniacs, demented, &c., who



had been long confined in Asylums, rarely joined in conversation, and allowed the use of oral language to pass into desuetude.

(e.) Sometimes language is reduced to sentences, but these may be pregnant with information as to the mental condition which is represented or misrepresented. This observation applies to a large number of those in whom aphasia is associated with paralysis, or forms an initiatory stage of cerebral disease. Many interesting examples are on record, but only two shall be cited, and these may be accepted as typical. Bateman gives a full history of a man who became first partially aphasic, amnesic, agraphic retaining, however, his intelligence perfect, and going about his occupations with his original activity and acuteness. He ultimately lost all language, was attacked with convulsions, and died of general paralysis. While his impairment was limited, and chiefly to forgetfulness of substantives, he could define, although not name, the objects placed before him. Thus if shown a poker, he could not recall that word, but at once said "It is a thing to stir the fire with," and, on being questioned, is it a stick? an umbrella? &c., he would answer, "No;" but, when the true name was pronounced, he said "Yes." Trousseau draws a very similar portrait of Marcou, who had forgotten the words signifying the most familiar objects, even of the instruments used in his trade, and who, on being asked what his night-cap was called, could not say, remarking however, at the same time, "and yet I know well what it is." When the wanting word was supplied, he said, "Oh, yes, it is a night-cap;" but the word could not be retained or recalled in a few minutes afterwards. Now, without pushing the argument too far, it is clear that while perception presented to the ideational centres correct impressions of the qualities of the objects presented, so that a correct judgment as to its nature and uses was arrived at, and while articulation remained perfect, even including the lost word, when that sign was communicated through the external sense, the intervening link, the power by which a sign is invented, or recognised, which shall represent the qualities and nature of the object, by means of articulate sounds, is totally abrogated, inasmuch as a mere volition, propagated through the

motor centres, cannot transmit the psychical impression until and unless it be represented by a verbal sign.

(*f.*) In addition to the above, there is a very large collection of cases in which whole classes of words appear to be lost. Most frequently this loss is confined to nouns and proper names, while verbs and other parts of speech are preserved, and, where aphasia is progressive, the substantives which we acquire first disappear first, and the other vocables follow; but the converse of this process occasionally takes place, and substantives are the only words employed. In the '*Phrenological Journal*'<sup>1</sup> there is described the state of a patient, then in Charenton, whose language consisted exclusively of nouns, and, what is singular, of such as may be called abstract terms. Thus, when asked how he was, his reply would be, "Malheur, injustice, audacité, courage, pitié, mort," without any connecting or qualifying word. He was, of course, of unsound mind, and supposed to be threatened with general paralysis, but the only indication of this was his impoverished vocabulary and his mode of utterance. It must be recollected that in the dialects of certain nations one word not only represents a vast number of objects, degrees of relationship for example, but that whole groups of words familiar to us are not to be met with. In North America the Tinné Indians have no word for 'dear,' or 'beloved,' and the Algonquin language is stated to have contained no verb meaning 'to love;' in others no word for the Deity or the Supernatural has been detected; the Tongans have no words for justice or injustice, cruelty or humanity. It has been somewhat rashly inferred that the absence of such words proves the non-existence of the moral qualities which they represent, but we are more inclined to attribute these gaps to the poverty and feebleness of that power by which signs are invented or applied. In aphasia, although no such expressions as affection, dislike, or respect are or can be employed, there is ample demonstration that these feelings are not extinct. It cannot fail to strike every one how nearly these states of decay and disease coincide with the infancy of the power of language, as perceived during the education of

<sup>1</sup> Vol. VIII., p. 415.

deaf mutes. This observation is justified by a most interesting series of letters written by this unfortunate class during their tuition, and published by the Dublin National Institution, and the works of M. Etard, contains sufficient evidence of its truth. One quotation from the latter will suffice. He states that the phrases employed are without pronouns, conjunctions, or any word which serves to express an abstract idea, but present only a confused union of adjectives, substantives, and some verbs without regard to tense—they being always put in the infinitive, as ‘Paris bien beau,’ ‘Alphonse content,’ ‘voir l’imperatrice,’ ‘bien chevaux blanc six,’ ‘Alphonse pas rester a Paris,’ &c.

(g.) An entire language has been swept away, leaving, however, the mind in possession of another or of others. Marco Polo is said to have utterly forgotten his mother tongue while on his voyages of exploration. In a *cause celebre*, which can scarcely yet be regarded as having terminated, a witness was produced to attest that having acquired two languages in her youth one had altogether perished from memory. A case came under my own observation where a young married lady, on recovering from the dementia and stupor succeeding what would now be designated hysterical paralysis, was found to have retained no knowledge whatever of any of the events or acquisitions, including languages, writing, music, &c., of her previous life, even of her marriage. She learnt the alphabet and the language, so long used by her, writing, knitting, &c., as a child, but with much greater rapidity and facility than a child could have done, and never regained the same command of the vernacular as she formerly displayed. Her caligraphy, as well as her disposition differed widely from those characteristic of her original condition, and she never resumed nor even recognised the ties nor engagements contracted in that state. Disease, which seems to imply alteration in structure, produces similar mental changes. Trousseau gives the narrative of an educated person, who, acquainted with French and Russian, being affected with right hemiplegia, utterly lost the former language, but continued to use the latter in a mutilated form, displaying, however, an unaffected intellect in studying geography, and playing whist. Dr. Banks minutely relates the history of a

learned aphasic with right hemiplegia, who, with great diminution in English vocables, was altogether shorn of his knowledge of Greek and Latin, but who, undergoing a patient re-education, and the triumph is most instructive, regained all that he had lost. Hun relates an almost equally extensive deprivation, and a somewhat similar recovery, by means of writing or the re-introduction of verbal signs to the mind through the eye. It is not easy to see, even on admitting a special faculty, and an organ of verbal signs, how one language could be sponged from the tablets of memory, while another remained indelible, except upon the principle that a foreign idiom is less deeply and permanently impressed than a native; but it is impossible to conceive that such loss, and such preservation, can be compatible with general mental powers and laws.

(*h.*) In transitory or paroxysmal aphasia, there is much support afforded to the position that the power of language is dependent upon the health and integrity of some portion of cerebral matter. Dr. Bateman gives an instance of this kind arising from blood poisoning, catamenial and critical periods. Mr. Dunn mentions a series of physical and moral accidents, immersion in water, suspended animation, convulsion, loss of speech, and, after a season, powerful emotional excitement, insensibility, and sudden recovery of language. To Dr. Jackson, of Philadelphia, we are indebted for the following illustration:—Perspiration was suddenly checked, this was followed by cerebral irritation, but, while intelligence and memory remained intact, only one grotesque articulation, ‘Didoes doe the doe,’ could be effected, which excited great mirth in the speaker. He was bled, and recovery of language was the result. In Mezzofanti, the greatest philologist the world has ever seen, a brief attack of fever completely blotted out the seventy-two languages of which he was a master, while the cessation of the paroxysm witnessed their restoration.

(*i.*) In temporary, or even momentary aphasia, there is evidence of even more fugacious affections of the cerebral substance, such as congestion, anæmia, molecular changes from psychical excitement, from atmospherical or electrical influences, with which we have little or no acquaintance. Every medical,



and even non-medical observer, must have met with examples of brief, but very annoying, forgetfulness of particular words, even of the individual's own name, but Crichton has signalised the most curious case of this kind, in which a person of distinction, calling upon a foreign ambassador, and being required to announce himself, turned to his companion in doubt and dismay, exclaiming, "For God's sake tell me who I am." Pliny Missala Corvinus, the orator, forgot his own name; but the most celebrated accident of this kind occurred when Massilon, the great pulpit orator, preaching before Louis Quatorze, and, perhaps, at the very moment when portraying a cruel and unjust tyrant he had pointed towards the King, saying solemnly, "Thou art the man," was suddenly bereft, not merely of the ideas which he had previously elaborated, but of the very words, and of all words which are so often substituted for irreclaimable ideas, and he stood aghast, powerless, and, for a time, aphasic. While we have the very best authority<sup>1</sup> for knowing that Dickens lost all recollection of the time during which he served in the ignoble situation of a bottle labeller, never, for twenty years, revisited the scenes of his servile boyhood, and never spoke of the circumstance, it is more germane to our present purpose to know, in his own words, that Lord Brougham "had always, except during the illness referred to, the blessing of robust health, only interrupted, when a child, by putrid fever, which produced an extraordinary effect in destroying my memory almost entirely; for I had just learned to read, taught by my father, and I had, in those ten days, lost all knowledge, even of the letters."<sup>2</sup> Professor Lordat, so often referred to in such inquiries, was aphasic, but enjoyed, or supposed that he enjoyed, the full exercise of his mental powers, composing, correcting, and extending lectures, was capable of recalling religious services, &c., &c., without any conception of words oral or written. He recovered and gave the above testimony. I accidentally removed an aphasia of ten years standing by the application of the shower bath.

(j.) What is tantamount to a virtual suspension of the power

<sup>1</sup> Forster's 'Life of Dickens.'

<sup>2</sup> 'Memoirs of the Life and Times of Lord Brougham,' written by himself, p. 15.



of language, although coincident with a copious and redundant vocabulary, consists of involuntary vehemence and volubility. Of this there is an illustrative instance contained in the 'Phrenological Journal'<sup>1</sup> of a chronic, inoffensive, but excitable maniac, in Saltpetrière, in whom the chief characteristic was the frightful and almost incredible rapidity with which her language was uttered. The term volubility is insufficient to convey a just conception of the impetuosity with which the words, distinctly enunciated, and perfectly significant, rushed forth. They appeared to outstrip the swiftness of thought itself. Another character, which, if clearly established, was still more calculated to excite astonishment and claim philosophical examination, was that, when they once flowed in a particular direction, or, to write more correctly, in accordance with a specific morbid train of feeling, their utterance was so irresistible as to be almost beyond the control of the will and inclinations of the speaker. That, to a certain extent, it was in her power to command or prevent this manifestation of derangement was demonstrated by the fact of her intercourse with the obnoxious individuals whose presence generally called it forth being sometimes unmarked by anything save the natural language which accompanied the exacerbation. But there was a circumstance which would lead us to believe that after the feelings which accompanied—if they did not produce—the paroxysm had assumed dominion over the less diseased faculties, her efforts to arrest the progress of either her thoughts or her words were unavailing. The tenor of all the entreaties, requests, and declarations—interspersed parenthetically, but spoken in the same exalted tone and hurried manner as the context—was that she did not mean what she said; that though she vowed vengeance, and showered imprecations on her medical attendant she loved him, and felt grateful to him for his kindness and forbearance; and that, though anxious to evince her gratitude and obedience by silence, she was constrained by an invisible agency to speak. While speaking, and even when unexcited, she walked backwards from the person to whom her address was directed. Such declamations appear to be akin to the rapid movements, and the violent actions of lunatics, but are

<sup>1</sup> Vol. VIII., p. 308.

sometimes consistent with rational demeanour and an otherwise unimpaired mind. That this extreme and invincible volubility is sometimes the effect of organic disease of the frontal lobes is proved by the case adduced by Velpeau, during the discussion in the French Academy upon the subject of aphasia, where a scirrhus tumour had destroyed the entire cerebral matter of these lobes, and where the incessant loquacity was followed by death. Such harangues sometimes degenerate into the involuntary use of absurd and inappropriate epithets, of denunciations, blasphemies, and obscenities, and of words conveying no meaning or a different meaning from that which was intended. Dr. Cadge, of Norwich, referred to by Dr. Bateman, mentions an individual in whom a tumour of the left anterior lobe was associated with vituperative language, changing into drollery, &c. While the power or will to employ known and intelligible language appears to be entirely subverted, there is sometimes substituted that improvisation of uncouth sounds, or the fabrication of new words, which are known in asylums as jargons. A characteristic exemplification of this symptom is afforded by the following passage, taken down from the lips of a patient in the West Riding Asylum, 3rd December, 1868:—"Kallulios, tallulios, kaskos, tellulios, karoka, keka, tarrorei, kareka, sallullios." The patient will jargonise in this way uninterruptedly for hours together, all the sounds which she utters being similar in character to those of which a specimen is given above, and having a vague resemblance to Greek. When spoken to or asked a question, she replies in this way, and seems surprised that the person to whom it is addressed does not understand it.

(k.) It is doubtful whether the manifestations, called "unknown tongues," were the consequences of delusion, delirium, or maniacal inspiration, but it is certain that in many of the vaticinators, especially those who were silenced by a fit or a faint, the articulations, whether preconcerted or not, were uttered in a state of unconsciousness, or without conscious volition, whether the words were deliberately and previously framed, or shouted out spontaneously and unpremeditatedly, and whether from a conviction that they were divine gifts and revelations, or

merely as human evidence of spiritual grace, they must be received as a species of aphasia. Fortunately, certain of the oracular ebullitions were taken down at the time, and have been published, and, without pronouncing any opinion as to whether the following example may be traced to one or more languages, or be, in all its parts, the suggestion of perverted reason and excited feeling, acting upon and through the power of language, or of sign invention, we feel called upon to compare it with the long-continued utterances, extensively committed to writing, of a female patient, long in seclusion, who had never heard of Irvingism or of any other unknown tongue, than of those mentioned in Acts ii., but who conceived herself to be inspired, as speaking the language of Heaven, and as revealing, in his own words, the will and the wisdom of the Holy Spirit. According to the authority of Mr. McKerrel<sup>1</sup> there was proclaimed in Christian Churches, about forty years ago, "Hippo, gerosto, hippo, booros, senoote, Foorime, oorin, hoop, Jamo, hoostin, hoorastin, hiparous, Hispanos, Bantos, Boorin, O Pinitos, Elalastina, Halimungitos, Dantitu," and there was spoken and written in the Montrose Asylum, about the same time, "Ellueam, vuruem, errexuem, vaulem, bathoram, ullem, dathureem, been, tuurem, ellexuem, vara, ellevara, exullem, dathellia, villera, civeu, ureme, vas, cillera, exeram, datherveam, liaulveiliueuem, villera, repthallon, erriphultou, bilirea, ebillerea, lubluron, eluberon," &c.<sup>2</sup> History tells us that hundreds of the Religionists, including children, of the Cevennes, against whom Marshal Villar's army was sent, prophesied and spoke in unknown tongues.

(L.) There may be placed in the same category instances of the involuntary transposition of words. The error does not necessarily alter or pervert the intended meaning of the proposition, amounting to nothing more than a departure from the ordinary laws of construction, and the infusion of absurdity into what may be grave and sagacious. There may co-exist with this, comparatively clear judgment, the power of representing thought, by suitable signs and natural precise articulation,

<sup>1</sup> A pamphlet, quoted in the 'Glasgow Herald,' Nov. 4th, 1831.

<sup>2</sup> Tracts on 'Religious Fanaticism,' by W. A. F. Browne.

so that the morbid element is restricted to the diminished control over the mode of arranging the signs, and must emanate from disease of the will. This enfeeblement of will is seen in what may be looked upon as conate errors, where one word is substituted for another, or where words are mispronounced consciously, or, it may be, unconsciously, but certainly in despite of the efforts of the speaker. A somewhat similar peculiarity is seen where diminutives and infantile expressions, and the impersonal pronoun, are persistently preferred to such terms as would accurately convey the meaning. This cannot be better illustrated than by translating a passage from '*Médecine Légale*,' of Hoffbauer,<sup>1</sup> a work of great excellence and interest. In the lowest degree of imbecility, that in which the *Paralysie Generale* of Calmiel generally ends, "The lunatic," he says, "often expresses himself by half-pronounced words; returns constantly to the same thing; communicates his ideas by short, broken, incomplete phrases, like the infant which retains the words although it cannot put them together. In such sentences, for example, he announces the subject and attribute, without connecting them; thus, in stating the idea 'the rose is beautiful,' he will say 'rose beautiful,' or only rose, or beautiful, according as the object, or its quality, first attracted his attention. He will often invert the natural order of things, and say 'rose beautiful is.' If, on perceiving his error, he attempts to correct it, he renders the sentence still more confused."

(*m.*) There are proofs of mental action manifested in language in opposition to the wishes and to the sense of propriety of the individual. In soliloquy, the operation of will in restraining the use of language within its usual conversational and natural bounds, as a means of communicating with others, is suspended, and the speaker either addresses himself, thinks aloud, or pours forth his thoughts and feelings without any consciousness that he is resorting to the employment of verbal signs at all. Many ludicrous illustrations of this habit in learned, abstracted, and absent persons are current, such as of the celebrated physician whose opinions could only be gathered by listening to his solitary monologue; of Lord Dudley Ward, whose brain was

<sup>1</sup> '*Médecine Légale*,' par J. C. Hoffbauer, tradiciid de L'Allemaud par Chambeuron.



injured by premature development, who audibly criticised his companions at table, and appeared unable to distinguish his subjective and objective language; but the affection is chiefly prevalent among the preoccupied and excited insane.

(n.) Under circumstances, such as during sleep or somnambulism, when, according to metaphysicians, as well as to physicians, healthy volition is entirely suspended, words, phrases, and lengthened statements are frequently uttered, the somniloquism may assume the form of exclamations, wild cries, rhapsodies, coherent answers to questions addressed to the sleeper, or the repetition of passages long since committed to memory. This condition is referred to disturbed circulation in the brain, to diseases of that organ, but is assuredly met with in the sound and sane. A domestic servant came under our notice who, although a simple and uneducated girl, was heard frequently during the night, and when perfectly unconscious, speaking in a language unknown to those around, and of which she had no recollection when awake. A clergyman, brought within hearing on purpose, at once recognised the unknown tongue as Latin. Upon inquiry, it was discovered that this individual had occupied an apartment adjoining the schoolroom, and only separated from it by a thin wooden partition. There she could not fail to listen, from day to day, to three boys engaged in reading the classics, and, without any act of will or consciousness on her part, the words had sunk into memory, had never been recalled, and were uttered during sleep without any act of volition or knowledge on her part. We record this fact upon our own authority, but believe that Dr. Abercromby has mentioned the case in one of his works, to which we have not at present access.

(o.) This relation aptly brings us to enlargement or elevation of the power of using articulate language, either during, or as a consequence of, affections of the cerebrum. The most interesting narrative of this class is that of a servant, who, during the ravings of fever, discoursed largely and vehemently in Hebrew, Latin, and Greek, she being an unlettered German. It was found that she at one time had been in the service of a Hebrew scholar, who was in the habit of reading and repeating



passages in that and other languages, and that these must have entered and remained unknown to herself as part of her mental constitution until the excitement of disease revived the original impressions which were to her in no sense significant.<sup>1</sup> Lunatics frame to themselves articulate sounds, which, they declare to be foreign tongues, French or Greek as the case may be, which they use to the exclusion of all other means of intercourse, seeming to feel pride in the possession of an accomplishment denied to others.

(*p.*) Apart altogether from the literary compositions in which the insane engage, and which are sometimes of rare beauty and excellence, and apart likewise from the versified bombast in which many indulge, we have encountered patients who uttered, and apparently were constrained to utter, rhythmical or rhymed expressions, it might be every word, or every word terminating a sentence. Dr. Hughling Jackson<sup>2</sup> gives cases of singing by speechless and hemiplegic children, who, at other times were dumb. We at one time examined a man who, for four nights and days spoke no word, but such as ended, or were made to end in 'ation.' His pronunciation was exact, the terms resorted to bore, so far as they could be interpreted, some reference to what was addressed to him, but no further than "gratification, robustation, jolification," meant that he was pleased to say he was healthy and happy, this iteration gradually ceased and he ultimately died of general paralysis. By what law or act of ideation, such symbolisation could be suggested or required is inscrutable, but it is clear that the power of remoulding words so as to answer this suggestion or demand was perfect and prolific, and that the enunciation of the articulate sign thus formed was distinct and intelligible. In conjunction with these manifestations, but often independently of them, are encountered incontrollable tendencies to sing and chant either recognisable words, or the cries of the lower animals.

I very recently examined, through the kind co-operation of my colleague, Dr. Gilchrist, 29 cases of morbid affections of language, or all in the existing population, 440 of the Crichton Institution, Dumfries. Of these 14 were females, and 15 males.

<sup>1</sup> Coleridge's '*Biographia Literaria*.' Vol. I., p. 117, 1847.

<sup>2</sup> '*The Lancet*,' 23rd September, 1871.

The former may be arranged in the following classes:—1st. Intermittent mutism 5, in 1 evidently connected with catamenia. 2nd. Constant mutism 7, of these 1 had been a public singer; 1 when roused could articulate having facial paralysis; 1 could not walk in consequence of spinal deformity; 1 was an idiot labouring under phthisis, and uttered cries when suffering pain. 3rd. One was reduced to monosyllabic utterances. 4th. One manifested incessantly day and night irresistible loquacity.

The 15 males may in like manner be divided into the following classes:—1st. Intermittent mutism 1. 2nd. Constant mutism 5, in 1 the mutism is of 20 years duration; in 1 it is accompanied by tremor of the limbs; in a third, who attempted to cut his throat, there is unintelligible muttering in soliloquy. 3rd. One was reduced to monosyllabic utterances. 4th. Two manifested constant loquacity, in 1, an idiot, there is congenital left hemiplegia; in the other, who is healthy, the loquacity is so great and rapid, that the words run into each other, so that he seems to speak in long sentences. 5th. Two presenting symptoms of general paralysis, the articulation is indistinct or unintelligible. 6th. In 1 case there appeared the omission of the first syllable of every word followed by alternate mutism and loquacity. 7th. In 1, an idiot, language is limited to a few words, and these are exclusively oaths, with congenital right hemiplegia and club-foot. 8th. Two idiots emit nothing but acute inarticulate cries, one roars like a wild beast.

It cannot fail to be noticed that while all these individuals are affected with cerebral disease, there is no indication of the existence of paralysis, except of the face, which, did not seem connected with the loss of speech in 2 cases of general paralysis, and in those of 2 idiots, where it was congenital, in one on the left, in one of the right side.

Some instruction may be gleaned from the steps towards recovery, which have been remarked in certain, we are entitled to say numerous examples of aphasia. It should be remarked in the first place, that hemiplegia may disappear and aphasia continue, and that the power of language may return while paralysis remains. There are narratives of restoration following bleeding, and even where the patient was reduced to one

unintelligible word "didoes doe the doe," by Faradization and by sudden moral emotion, and of the sudden resumption of language without any obvious cause. Perfect re-establishment of mental health and language appears to have taken place after fracture of the frontal bone involving the orbit, after severe injury to the left side of skull, right hemiplegia and aphasia, (Romberg) after aphasia from lead poisoning with the additional disturbance of prolonged utterance and repetition. In general the process is gradual and laborious by the same, and as slow an education as in children, even commencing with the A, B, C, by causing one word to suggest another, *e.g.*, rose-nose, nosegay, by seeing words written, or conveying the impression by the eye as well as by the ear, a similar result has been accomplished in mute idiots. A rare instance of recovery is recorded where the defect consisted in the involuntary transposition of words. The disappearance of aphasia, whether under treatment or not, after injuries and diseases so serious, must be accepted as an indication that it may depend upon conditions much more transitory and curable than alterations of the frontal convolutions are generally esteemed to be. Such a consideration does not, however, affect the inquiry as to the localization of language. In a few of these individuals, although language may have been said to be reacquired there were detectable circumlocution, difficulty in summoning up certain words, and other proofs that there were still restrictions on its perfect use, and there is at present in the West Riding Asylum a female who, as a complication of mental disease, was aphasic, and who now, although capable of expressing herself well, displays hesitancy, and at times of excitement, loses the power of language altogether. An interesting case of this nature is given by Dr. Lockhart Clarke, in the '*Lancet*,'<sup>1</sup> in which nearly complete aphasia co-existed with right hemiplegia, &c. The man recovers, and six years afterwards, it is said, that he "not only superintends his business, but can walk six miles without fatigue, that his intellect is perfectly clear, and his memory is excellent, but that he has still some difficulty of articulation, although he can say everything that he desires, and keeps up a continuous conversation. His articulation

<sup>1</sup> May 18th, 1872.

much resembles that of a foreigner whose pronunciation of English words is awkward and difficult."

There has been no attempt made to cast these various propositions into a logical sequence. The principle objects aimed at have been to present a broader view of the subject of aphasia, and to show that a very large number of different deviations from the normal use of language must be taken into consideration besides its abolition, before we are in a position to generalise confidently upon the subject. It must be confessed that the physiological and pathological evidence as to the localization of an organ for such a faculty is as yet incomplete or contradictory, although it may be admitted that the weight both of scientific research, and scientific opinion preponderate in favour of the conclusion that some part of the anterior lobes, and perhaps some part of the orbital region, are connected with the formation and expression of articulate signs of thought. It may be stated as universally believed that integrity of the cerebrum or of some part of it, is necessary for the healthy expression of language, or, as it may be otherwise stated, that a material and distinct organ is required for this special power. It must have been observed in the first place that almost all morbid manifestations of this power were observed in persons labouring under cerebral disease, temporary or permanent, proved by dissection or inferred from the presence of mental disease. It must have been observed in the second place that this connection is nearly as clearly established in the most trivial and evanescent as in the most grave forms of aphasia. It must be observed, in the third place, that where there is no evidence of cerebral alteration, there are detailed proofs of local injury, general or remote disease, which, however amenable to treatment, must have influenced all parts of the nervous tissues; and, fourthly, that when aphasia precedes hemiplegia, as it sometimes does, for many years, it appears legitimate to conclude that the lesion of the frontal lobes and of the left hemisphere, or of the left third frontal convolution, is somewhat different in nature from that which produces the paralysis, and, in fact, much less severe and formidable; and, lastly, that although Gall, Broca, and all other observers, insist upon the destruction of a particular part of

the cerebrum as involving and necessitating the extinction of the power of language, they do not contend that congestion, anæmia, molecular changes, distant irritation, and even the stimulation of mental action, as well as that of alcohol and narcotics, must act upon and influence the functions of the same part of the cerebrum, and impose limitation, exaltation, incoherence, in accordance with their ordinary mode of operation.



# THE SPHYGMOGRAPH IN EPILEPSY.

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THE cases of epilepsy to be found in the wards of an asylum, do not provide the best field for the study of that malady, because it not unfrequently happens that at the most interesting periods in the physiological sense, the excitement, which is the reason of the detention of the patient in an asylum, is so great that any means of observation which require at least quietude on the part of the individual on whom the observation has to be made are difficult to attain, and the results which follow are often rendered comparatively useless. This condition of excitement is by no means confined to the intellect and emotions, but pervades the whole system; and it is a well known fact that whatever disturbing cause we may have in ordinary practice, that will most certainly be much exaggerated amongst the insane.

Another, and much more important difficulty which has to be contended with, is that hitherto the graphic method of observation has received so little attention, that assistance from any quarter with regard to the forming of an opinion on the indications which are denoted by the ever varying forms of pulse-tracing is not to be looked for, and particularly does this remark apply to the workers in this special department of medicine. I should acknowledge here, however, a few hints

received by the perusal of the able contribution to sphygmographic literature from the pen of M. Lorain, of Paris.<sup>1</sup> Amongst the many hundreds of tracings found in M. Lorain's volume, are to be found three, taken from individuals suffering from poisoning by burning charcoal, tetanus, and epilepsy. These tracings resemble each other in some degree, but yet each possesses characteristics peculiarly its own. Fig. 293, (in M. Lorain's book) shows the form of pulse-tracing found in a person suffering from charcoal poisoning. It is full and rounded, with but a faint attempt at an aortic notch. It will be seen subsequently that this is the form of tracing found in the condition known as the "status epilepticus," which condition is very common in lunatic hospitals. The tracing showing the condition of the pulse in tetanus, was taken in the quiet stage, when spasmodic action was not present, and though it is but a modification of the normal pulse wave, has a decided leaning to the epileptic form. M. Lorain's case of epilepsy gives a distinct dicrotic notch, and from its resemblance to the form seen in febrile affections rather suggests the possibility of the presence of a feverish condition. Still it is a modification of the kind of pulse-wave seen in the "status epilepticus."

It will be remembered that the conditions necessary for the occurrence of a healthy succession of events in sphygmographic tracings are, (1) a healthy heart so sensitive that at the moment of filling it shall send its contents into the arterial system; (2) a system of valves so perfect that they shall prevent regurgitation; and (3) arteries of such resiliency and consistence as readily to receive and transmit the blood. I have elsewhere explained how very important is the parts played by the arteries and capillaries in the circulatory system, and how to them alone is due the polycrotic tracing found in persons suffering from chill, and from general paralysis of the insane. As in the case of the instances brought forward to show the influence of the vessels in determining the pulse form in general paralysis, I have taken care to ascertain the exact condition of the heart, and of the three cases now brought forward two at least presented no superficial

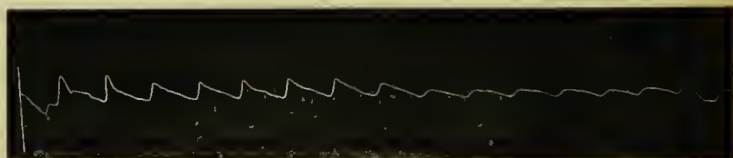
<sup>1</sup> 'Le Pouls, ses variations et ses formes diverses dans les maladies,' Paris, 1870.

sign which would lead to a suspicion that organs was in any other than a normal state.

The excepted case may with advantage be taken first, because, in a single tracing may be seen a pulse-form modified in a double manner, by the administration of Ergot of Rye, and the occurrence of an epileptic seizure.

F. H., *ætat.* 26, was admitted to the Bristol Asylum, in 1865. It is recorded in the case book that the epilepsy from which he had then suffered for 10 years, was caused by a blow on the head. Since his admission the numerous notes show that he suffered most severely from the fits, and that no day passed without the occurrence of several attacks. Twelve months ago he was in a perpetual state of stupor, which, seemed to be relieved by Bromide of Potassium, and Tincture of Sumbul, which were then given to him. The result of continued treatment was that he got more lively, and became an efficient ward helper. But now a new symptom developed itself, from being stupid and helpless, he became irascible and destructive. The "spasm" which had originally shown itself, in almost absolute dementia and muscular disturbance, now seemed to spend itself in passionate outbursts occasionally amounting to fury. A sphygmographic tracing taken at that time (January, 1872,) showed the usual epileptiform character which will be seen at the latter half of the tracing. Ergot was then given, and soon the pulse form resembled in some degree the long polycrotic marking found in general paralysis.

FIG. 1.



The accompanying tracing was taken early in May, and at that time it was thought that he was on a fair way to permanent amendment, as he seems still to be. Much care was taken in avoiding any undue excitement while the sphygmograph was being applied. The pulse beat 85 times per minute at first, but quickly rose to 100. The rack work of the instrument was set in motion "in the nick of time," for, before the few seconds had passed which were required for the passing of the slide over the clock work box of the instrument, he began to give vent to an epileptic cry, and this was followed by a distinct spasmodic seizure.

The case of F. H., then, possesses a two-fold interest for, as has been remarked, we get in one tracing two very opposite forms. The first 7 or 8 waves show a condition of artery totally distinct from the condition shown by the succeeding ones. In the one there is seen a marked power of contraction, so that the

result is a modified normal pulse-wave. In the other some influence antagonistic to muscular contraction seems to have taken possession of the vaso-motor system which leads to a very feeble attempt at arterial contraction. The change in form was synchronous with the commencement of the cry, which gave warning of the onset of the epileptic seizure which followed.

G. W., *ætat.* 32, has been epileptic since childhood, a sister is occasionally the subject of recurrent mania. G. W. labours under delusions such as that God is in his inside, and that his food is poisoned. He has a very strong aversion to medicine of any kind on account of the latter delusion, and the result is that no treatment is adopted which has a curative object. He is desperately suicidal, and has made several attempts at self destruction, both before and since his admission. He hardly ever passes a day without having a fit, and the seizures are of the severest possible kind. The tracing No. 2 was

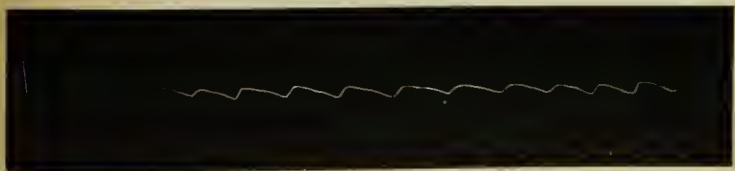
FIG. 2.



taken on a day when he had not a fit, but while suffering from the effects of fits on the previous day, and is one of many taken at various times, all of which possess the same character, subject to slight modification.

W. B., *ætat.* 35, a fine muscular subject, has been epileptic for several years. The accompanying tracing was taken on a day when he had been seized with

FIG. 3.



several fits, and while he was labouring under considerable excitement. At that time he was taking Bromide of Potassium but only in small doses. Tracings taken at other times show that the pulse assumes that shown at Figure 2.

As far as my experience goes, the form shown at Fig. 2 is such as may be accepted as the type while the epileptic "status" exists, and may, I think, be attributable to a lax condition of the

vessels. It will be seen that in Fig. 2 no attempt at the formation of an aortic notch is made, which would be the necessary and certain result of the quick rebound of the blood against the upper surface of the aortic valves, but that on the other hand, the blood when sent into the arteries rapidly escapes, owing to dilatation of the capillaries. I have drawn a comparison between the form of pulse found in charcoal poisoning and that seen in epilepsy.

The case of F. H. (Fig. 1) points to a deeper source than the mere want of areation of the blood, because, as has already been observed, we have in one view a normal pulse modified in the first instance by a drug, the power of which to contract the arteries is now undisputed, and in the second all this power of contraction set aside by the *onset* and not the *result* of an epileptic fit.

The cardiac abnormality, referred to previously as existing in the case of F. H., consists in slight incompetence of the aortic valve, and it has been noticed by those in attendance, that when the Ergot is regularly administered, and no fits occur, so much cedema of the feet occurs as is sufficient to make him uneasy, in a pair of shoes, which, on other occasions, cause no uneasiness. Besides this, at times, a faint regurgitant murmur may be heard with the second sound of the heart. This fact is shown in a marked degree in the first pulsation, and is gradually cleared off as the succeeding waves are formed.



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